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OPERATIVE GYNECOLOGY

OPERATIVE GYNECOLOGY

BY

HARRY STURGEON CROSSEN, M.D., F.A.C.S.

PROFESSOR OF CLINICAL GYNECOLOGY, WASHINGTON UNIVERSITY MEDICAL SCHOOL, AND GYNECOLOGIST IN CHIEF TO THE BARNES HOSPITAL AND THE WASHINGTON UNIVERSITY DISPENSARY; GYNECOLOGIST TO ST. LUKE'S HOSPITAL; CONSULTING GYNECOLOGIST TO THE JEWISH HOSPITAL, ST. JOHN'S HOSPITAL AND THE ST. LOUIS MATERNITY HOSPITAL; FELLOW OF THE AMERICAN GYNECOLOGICAL SOCIETY AND OF THE AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS, AND ABDOMINAL SURGEONS.

THIRD EDITION

EIGHT HUNDRED AND EIGHTY-SEVEN ORIGINAL ILLUSTRATIONS

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PREFACE TO THIRD EDITION.

In an appreciative criticism of the second edition, the hope was expressed that my personal views and practice would later be given in more detail. The suggestion that this would be helpful in conditions where there are many methods of operative treatment, as in retrodisplacement and in prolapse, has prompted compliance with the request.

In incorporating new matter, more than ninety new illustrations have been added. One problem of special interest, because it is so difficult, is the relief of sterility due to occlusion of the proximal portion of the fallopian tubes.

H. S. Crossen.

PREFACE TO SECOND EDITION.

The multiplicity of operations for prolapse of the uterus and bladder has reached a stage where a clarifying classification is needed—a classification which will show at a glance the relation of the operation to the anatomical structures involved and also, incidentally, the relation of each operation to the other operations employed in this condition. Such a clarifying classification of retrodisplacement operations was made in the first edition of this work and, according to reports, has proved decidedly helpful in removing confusion and giving a comprehensive grasp of that operative situation. A similar service is now needed in regard to prolapse operations.

Another effect sought in such classification is the substitution of descriptive anatomical terms for the personal nondescriptive designations. A large number of operations designated only by the name of the originator, or of the first or second or third modifier, militates against a clear understanding of the operative situation as a whole. There is no objection to the use of a personal name as a short designation for a clearly understood operative measure, but there should be also a descriptive anatomical designation locating that measure in the general scheme of operative treatment.

In bringing the work up to date considerable new matter has been added, including over sixty illustrations. Nearly all the new illustrations were made by Mr. Ivan F. Summers and show his usual satisfying care and skill.

H. S. Crossen.

PREFACE TO FIRST EDITION.

This work is devoted exclusively to operative treatment. The endeavor has been to present this fully in all its bearings—the technique of the various operations, the difficulties likely to be encountered, the indications for operation in the various diseases and the selection of the exact form of operative procedure best suited to the particular case. In order to have space in a single volume for a satisfactory consideration of the operative treatment of diseases of the female genital tract, it was necessary to exclude nearly all extraneous material, such as operations on adjacent organs and the details of general surgical technique.

The time is ripe for a systematic presentation of the various operative procedures available for the treatment of each gynecologic lesion. Gynecologic surgery is entering a new stage of development. The past may be designated the period of invention of methods. To such an extent has this been carried that for the treatment of uterine displacement alone more than one hundred operative procedures have been devised. The new stage of development may be designated the period of adaptation of operative methods to the exact pathological conditions present in the individual patient. This period of development is as important as the preceding one, perhaps more so when considered from the standpoint of lasting benefit to the patient.

That the period of careful adaptation of operative procedures to the exact pathological conditions present in the individual case is just beginning, is evidenced by the fact that until very recently the attention of nearly all workers in this operative field was centered in finding, for each gynecologic lesion, some operation which would be a cure-all, that is, some operation which would be the best for every case of that disease. So completely has this idea predominated that up to the present time operators generally, and even gynecological teachers to a considerable extent, have championed some favorite operation as *the* operation for the disease under consideration. As a result, there are a number of operations each of which is strenuously advocated as the best for practically all cases. This state of affairs prevails particularly in the treatment of retrodisplacement of the uterus and prolapse of the uterus, but is evident to some extent in connection with most of the important gynecologic lesions. Now, the error does not lie in the difference of opinion, for there will always be differences of opinion in connection with so complex a subject. The error lies in assuming that any one operative procedure could be the best for every case of a particular lesion. A study of the various pathological conditions present in the pelvis in different cases of a disease, as such "living pathology" has been revealed by the operative work of the past two decades, shows that the conditions differ greatly in different cases of the same disease. An operation which would be entirely satisfactory in one

case might fail completely in another case—not because of lack of skill in its execution but because it was not suitable for the combination of conditions present in that pelvis.

The patient is given the best service only when the operator, familiar with the pathology of the pelvis and with the various operative procedures available, makes a careful study of the conditions present in the individual case and selects the operation most suitable for that particular combination of pathological changes. This *selective* treatment is the keynote of this work, and it is my hope that the work may aid materially in the elucidation and advancement of this important feature of gynecologic surgery.

There are seven hundred and seventy original illustrations. A few of them, and portions of the text dealing with operative work, are transferred from my textbook (Diseases of Women) to this operative volume, thus leaving room in the textbook for additional matter in the next edition.

Nearly all the drawings were made by Mr. Ivan F. Summers, whose ability and sustained interest I appreciate very much.

My thanks are due to the publishers for their helpful courtesy and coöperation throughout the preparation of the work.

H. S. Crossen.

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OPERATIVE GYNECOLOGY

CHAPTER I.

RETRODISPLACEMENT OF THE UTERUS.

The startling newness of effective surgical treatment is well illustrated in the development of such treatment for displacements of the uterus. Though for thousands of years women have suffered from these conditions, it is only within the last fifty years that methods really curative for the severe cases have been devised and put in use.

The first definite plan for the operative correction of retrodisplacement of the uterus appears to have been proposed by Alquié, of Montpellier, France, in a memorial to the Academy of Medicine, in November, 1840. The plan was to shorten the round ligament of each side by drawing it out along the inguinal canal. He had performed the operation upon animals and upon the dead subject, but not upon the living woman.

The proposition of Alquié was referred to a commission composed of Baudelocque, Bérard and Villeneuve, who, after wrestling with the problem for four years, finally reported to the Academy. In this report the proposal of Alquié was condemned, both in regard to the possibility of permanently correcting uterine displacement by shortening the round ligaments and in regard to the practicability of the operation itself. A vote of approbation was given Alquié for his prudence in never having attempted the operation upon a patient.

In 1850, Amussat sought to permanently correct retrodisplacement by cauterizing, with caustic potash and the actual cautery, the posterior vaginal vault, so as to cause adhesions there that would hold the cervix backward and thus tip the fundus forward.

In 1858, Aran seemed to grasp the importance of Alquié's proposition, that shortening the round ligaments would bring into position a uterus displaced backward or downward. But he was deterred by the difficulties of the operation, considering its successful execution next to impossible.

In 1859, Marion Sims proposed to fasten the retrodisplaced uterus forward by means of a silver wire passed through the abdominal wall and through the fundus uteri. A special hollow needle was constructed for passing the suspending suture. He began the operation, but did not finish it, being impressed, evidently, with its dangers.

In 1864, Deneffe, at Ghent, Belgium, attempted the operation of shortening the round ligaments. "During his student days he had frequently practiced the operation successfully upon the cadaver, and immediately upon obtaining

his degree, requested of Burggraeve and Soupart an opportunity to shorten the round ligaments upon the living woman, avowing his confident belief that he would be able to carry the operation to a successful conclusion. His request was granted and, in the presence of the masters, the operation was undertaken upon a patient suffering from prolapse. Deneffe, however, failed to find either round ligament, although, following a suggestion of the great Burggraeve, he opened up the entire inguinal canal on both sides. The patient recovered from the attempt, but Burggraeve was promptly called to account by the Commission des Hospices for permitting experiments upon patients committed to his care.''*

In 1869, Koeberle suspended the uterus by stitching an ovarian pedicle in the lower angle of an abdominal incision. He had observed that the position of the uterus was influenced by the attachment of the tumor pedicle in the abdominal incision after laparotomies, and he conceived the idea of fixing a portion of the uterus or its appendages in the abdominal incision as a measure of election in retrodisplacements. Practically the same procedure was employed by Schroeder in 1879. In 1880, Lawson Tait, in a case in which he had to remove the appendages, suspended the uterus by including it in the sutures for closing the abdominal wall. Hennig did the same in 1881.

Kaltenbach operated several times by incising the abdominal wall to the peritoneum and then passing a silver suture through the peritoneum and fundus uteri, the uterus being held firmly up against the bottom of the wound during the operation.

In December, 1881, William Alexander, of Liverpool, performed the first successful shortening of the round ligaments upon the living woman, and, in 1882, James A. Adams, of Glasgow, performed the same operation. In Adams' case, however, it did not prove effective, as the uterus was adherent posteriorly. Adams published his case in 1882, while Alexander did not publish his until some six months later, in January, 1883.

In 1883, Herrick sutured the cervix uteri to the vaginal wall posteriorly for the correction of retrodisplacement.

Ventral fixation of the uterus, as an independent operation, was conceived and executed independently by Olshausen, of Berlin, and Kelly, of Baltimore, in 1885. Olshausen published in 1886, while Kelly although his first operation was carried out in 1885, did not publish until 1887. In Kelly's report of his own case, he referred to unpublished cases similarly treated by Brennecke, of Magdeburg, Werth, of Kiel, and Sänger, of Leipsic.

In 1886, Wylie operated by intraperitoneal folding of the round ligaments, while in 1888, Bode, working independently, described the same operation.

In 1888, Kelly operated for shortening the utero-sacral ligaments per vaginam, and in the same year Byford published two cases similarly treated.

*Geo. W. Edebohls, Am. Gynec. and Obstet. Jour., Dec., 1896.
For the historical data here given, the author is much indebted to this splendid monograph by Edebohls, and also to an excellent article by Franklin H. Martin (Am. Jour. of Obstet., April, 1904).

In 1888, Sänger suggested fastening the fundus uteri forward by means of a suture passed through the anterior vaginal wall (vaginal fixation). A little later Schücking carried the suggestion into effect, and devised a special handled needle for the purpose. It became evident, however, that injury to the bladder was almost inevitable, and vaginal fixation was dropped.

Mackenrodt (1892) rendered vaginal fixation safe and more effective by incising the vaginal wall and separating the bladder from the uterus. A little later in the same year, Dührssen published a similar operation, except that the fixation sutures were passed somewhat higher.

Winter (1893) modified the Mackenrodt operation by doing an anterior colporrhaphy in every case, to give a better fixed point for the uterine fixation sutures.

Küstner (1894) still further modified the Mackenrodt operation by the very important step of opening the peritoneal cavity at the vesico-uterine pouch as a routine measure.

In 1896, Vineberg, Wertheim, and Bode, each working independently, shortened the round ligaments by anterior vaginal section.

In 1897, Goldspohn extended the usefulness of the Alexander operation by opening the peritoneal cavity at the internal ring on one or both sides, thus permitting the introduction of the finger for breaking up light adhesions.

In 1900, Gilliam described the method of drawing the proximal portion of the round ligament of each side through the rectus muscle and aponeurosis near the median incision. He was led to this operation by the suggestion of Ferguson to cut the round ligament and draw it through the posterior sheath of the rectus muscle.

In 1901, Webster described a method of shortening the round ligament of each side by drawing it back of the uterus through a small opening in the broad ligament just under the utero-ovarian ligament.

In 1902, Bovée described a method of shortening the utero-sacral ligaments through the abdominal incision.

In 1903, Alexandroff published a method of anterior coaptation of the broad ligaments in front of the cervix, through a vaginal incision.

The foregoing represents the beginning of the various important classes of operations for retrodisplacement of the uterus. The present effective operative measures have been reached through many improvements and modifications, as indicated in the following table.

CLASSIFICATION OF OPERATIVE MEASURES.

The operative measures for holding the uterus forward are very numerous, the number running well above a hundred. There are, however, certain representative measures that may be mentioned in order to give an idea of the various methods of approach and the various structures utilized. The methods

of approach are (A) through the inguinal canals, (B) through a median abdominal incision, and (C) through the vagina.

A. Through the Inguinal Canals.

I. Extraperitoneal Shortening of the Round Ligaments (Alquié, anatomical work, 1840; Alexander, 1881; Adams, 1882). An incision is made over the inguinal canal on each side and the round ligament is isolated and drawn out sufficiently to take up the slack and bring the uterus forward. The peritoneal cavity is not opened.

a. Utilizes the strong proximal portion of the round ligaments for supporting the uterus.

b. Operation is entirely extraperitoneal, hence little danger of peritonitis.

c. Does not permit the breaking up of adhesions or treatment of adnexal lesions.

d. Does not permit direct exploration of the pelvis, to ascertain abnormal conditions or to make certain that the uterus comes well forward without complications.

e. Ligaments pull laterally instead of forward and hence permit return of displacement when there is much backward tendency.

1. Ligaments sought at the external inguinal ring (Alquié, anatomical work, 1840; Alexander, 1881; Adams, 1882).
2. Execution of the work through a very short incision or puncture at middle of the canal or somewhat higher (Alquié, anatomical work, 1840; Kellogg, 1888).
3. Ligaments sought at internal ring as a routine procedure (Newman, 1888).
4. Laying open the whole length of the inguinal canal as a routine step in finding and shortening the round ligaments (Edebohls 1890).
5. Long skin-incision, from pubic spine to anterior superior spine of the ilium, with fastening of excess of ligament of each side above canal toward iliac spine (Kocher, 1893).
6. Transverse skin-incision, extending from one external inguinal ring to the other (Duret, 1893).
7. Ligament of each side cut and the proximal stump split longitudinally for about an inch and each half sewed to the external fascia (Carpenter).
8. Ligament of one side drawn subcutaneously through the pubic fat to the opposite side and there tied with its fellow (Abbe, 1888; Doleris, 1889; Bachelor, 1894; Martin, 1896).

9. Ligament of each side brought out through, and sutured to, a puncture of the skin some distance from the incision (Cleveland, 1894).
10. Two-stage operation—shortening one round ligament at one sitting and the other a few days later (Blake, Doleris).
11. Wound left open for granulation, to form scar-tissue and thus prevent hernia (Fry).
12. Sewing lower edge of internal oblique and transversalis muscles to Poupart's ligament to prevent hernia (Fabricus, Edebohls).
13. One ligament only shortened—this being depended on to keep the uterus forward (Küstner, 1909).

II. Inguinal Coeliotomy with Shortening of Round Ligaments (Goldspohn, 1897). The steps are the same as for extraperitoneal shortening of the round ligaments except that the peritoneal cuff is opened and a finger introduced into the cavity on one or both sides.

a. Utilizes the strong proximal portion of the ligaments for supporting the uterus.
b. Permits partial exploration of the pelvic cavity and the breaking of light adhesions.
c. Opens peritoneal cavity, hence carries danger of peritonitis.
d. Does not permit thorough exploration of pelvic cavity and treatment of serious adhesions and other lesions, as median incision does.
e. Ligaments pull laterally instead of forward.

III. Extraperitoneal Transplantation of Round Ligaments. (Figueroa, Mexico, 1913). The exit of each round ligament through the musculo-aponeurotic wall is moved toward the median line, and the shortened ligaments are thus given a forward pull, all the work being accomplished through lateral incisions and without opening the peritoneal cavity.

a. Utilizes strong proximal portion of the ligaments for support.
b. Operation is entirely extraperitoneal.
c. Ligaments have a good forward pull, which is not the case with the ordinary Alexander operation.
d. Peritoneal cavity is not opened, hence the operation does not permit of safely breaking adhesions or treating the adnexal lesions which are so frequently present in these cases.

B. Through Median Abdominal Incision. Pertaining to all the operations in this class are the advantages of thorough exploration of the pelvis and lower abdomen and the safe removal of diseased structures, including the appendix when necessary. The opening of the peritoneal cavity carries with it some danger of peritonitis. The advantages and disadvantages of each submethod are indicated below.

I. Ventro-fixation. The fundus uteri is fastened securely to the abdominal wall by a pedicle of unyielding tissue or by extensive scarification and suturing or by pushing aside the peritoneum and securing the uterus directly to the fascial tissue of the wall.

a. The fundus uteri is fastened forward very securely, so that there is hardly a possibility of a return of the retrodisplacement.

b. The technique is simple and easily executed.

c. This firm fixation causes serious interference with the development of the uterus in pregnancy, hence should not be used in cases where there is a chance of future pregnancy.

1. Ventro-fixation of the uterus by pedicle—fastening of ovarian pedicle in lower angle of abdominal incision (Koeberle, 1869; Schroeder, 1879).

2. Ventro-fixation by sutures in fundus uteri, incidental to other operative work—the sutures for closing the abdominal wound being made to include the uterus (Tait, 1880; Henning, 1881).

3. Ventro-fixation as a separate and predetermined operation (Kelly, 1885; Olshausen, 1885). These were firm fixations. The operations were planned for and carried out in patients with inflammatory lesions, in which the adnexa had to be removed—hence there were no pregnancies afterwards to cause trouble. Olshausen passed the sutures through the round ligament at the uterine horn, and Kelly passed the sutures through the tubo-ovarian pedicle. Silver wire was used by Olshausen and silkworm-gut by Kelly.

A little later the operation was employed in patients not requiring removal of the adnexa, the sutures being passed through the uterine origin of each round ligament or through the utero-ovarian ligaments. The latter technique was recommended by Kelly as giving the fundus uteri a better forward inclination. Boldt (1890) and Leopold (1890) advised and practiced passing the sutures directly into the fundus uteri. All these were still fixations. Much tissue was included in the sutures, and extensive and firm

adhesions between uterus and abdominal wall were formed. As the operation was carried out on many patients without removal of the adnexa, serious results in pregnancy soon became manifest.

4. Ventro-fixation by passing the sutures through the fundus uteri and adjacent portion of round ligaments (Vineberg, 1911).

5. Return to method of suturing anterior instead of posterior surface of fundus uteri to abdominal wall, in case the adnexa were not removed, so as to allow of better expansion of uterus if the patient should become pregnant. This does not give as firm or as lasting forward fixation of the uterus as when the posterior surface is sutured. It diminishes the danger of serious trouble in pregnancy, but does not eliminate the danger. (Ventro-fixation by this method is still used in the child-bearing period by some operators—Giles, Briggs, Griffith and others, 1913).

II. Ventro-suspension. The fundus uteri is fastened lightly to the abdominal wall. The idea is to secure the formation of a band of tissue which will hold the fundus forward (suspend it from the wall), but will not interfere with the development of the uterus in pregnancy. Some prefer to pass the suspension sutures through the utero-ovarian ligaments rather than directly through the uterine tissue.

a. Direct forward pull holding the uterus well forward.
b. Technique simple and easily executed.
c. Uncertainty of ultimate result. The suspending band may become so stretched that it permits return of the displacement, or, on the other hand, an unusual amount of scar-tissue may form, causing a firm fixation of the uterus to the abdominal wall, which would seriously interfere with pregnancy.
d. There is a free band in the abdominal cavity, occasionally leading to intestinal obstruction.

1. Ventro-suspension by sutures which include little more than peritoneum and pass into the posterior instead of the anterior surface of the fundus uteri (Kelly, 1893).

2. Ventro-suspension of the uterus by using the urachus as a suspensory ligament (Fowler, 1895).

3. Ventro-suspension by means of strips of peritoneum cut from the sides of the abdominal wound and passed under the peritoneum of the fundus uteri (Martin, 1896; Foster, 1911).

4. Ventral suturing of fundus uteri and round ligaments, the line of sutures uniting the uterus and both round ligaments to the under surface of the abdominal wall (Sinclair, 1907).

III. Intra-abdominal Shortening of Round Ligaments.

A. Folding of the Round Ligaments in Various Ways.

a. No interference with pregnancy, as the round ligaments enlarge with pregnancy and undergo involution afterward.
b. No free band in abdominal cavity.
c. The strain comes on the weak part of the ligament near the inguinal ring. This may stretch and permit return of displacement.
d. The pull of the ligaments is lateral.

1. Folding each round ligament upon itself and suturing it with point of fold directed outward (Wylie, 1886; Bode, 1888).
2. Crossing the folded round ligaments and suturing them together (Polk, 1888).
3. Folding each ligament upon itself so there are three thicknesses. The folds are then sutured together and are also sutured to the uterus at one end and to the parietal peritoneum at the other end (Mann, 1895; Langes, 1913).
4. The round ligament of each side is crumpled up by a suture running in and out and along the top of the ligament. When tied it approximates all the included tissues, shortening the ligament to that extent (E. C. Dudley, 1906).
5. The round ligament of each side is drawn out of the canal as far as possible. A linen suture is passed through it at the point of exit and then through it several times down to near the uterus, and tied—thus reefing or "shirring" the ligament (Long, 1916; Beessesen, 1917).
6. The round ligaments are folded onto the anterior surface of the uterus and sutured there, with or without denudation of approximated surfaces (A. P. Dudley, 1900; Latzko, 1908).
7. The ligament of each side is drawn out of its peritoneal covering through a small opening, the denuded portion folded, the sides of the folds sutured together and the folded portion tucked back under the peritoneum through the small opening (Morris, 1901).
8. Ligament of each side drawn out of its peritoneal covering, the two loops stitched together and then sutured to the anterior surface of the uterus (Sperling, 1904).
9. Loop of round ligament of each side freed from its peritoneal covering and sutured over the horn of the uterus (Jerie, 1909).

10. Implantation of the resected round ligament of each side into an incision in the fundus uteri. Intended particularly for cases in which the adnexa are excised. (Liepmann, 1912.)

B. Folded Ligaments Attached to Abdominal Walls.

a. Gives somewhat stronger anterior fastening.
b. Some methods change direction of pull from lateral to forward.
c. Peritoneal adhesions are likely to stretch in time and may permit return of retrodisplacement.
d. Free bands may be a source of danger.

1. The folds of the round ligaments are attached at the lower angle of the abdominal wound (Richelot, 1900).
2. The fold of ligament on each side is stitched to the anterior abdominal wall opposite the external inguinal ring (Byford, 1903).
3. The folded ligaments are sutured to the anterior surface of the fundus uteri, and then the uterus is fixed to the abdominal wall by passing the sutures through the sutured ligaments instead of through the uterus itself (Freund, 1906).
4. The round ligament of each side is sutured to the anterior abdominal wall, from the internal inguinal ring to within a short distance of the median line (Neuhof, 1913).

C. Round Ligament of Each Side Drawn Backward Through the Broad Ligament and Fastened Posteriorly.

a. Changes direction of ligaments so they have a somewhat forward pull.
b. No free bands left in the cavity.
c. Strain falls on the weak portion (distal portion) of ligaments.

1. Round ligament of each side is drawn backward through the broad ligament just below the utero-ovarian ligament, and sutured to the posterior surface of the uterus (Andrews, Webster, 1901).
2. Round ligament of each side is drawn backward through the broad ligament and under the peritoneum of the uterine wall to the median line posteriorly (Wardlow, 1919).
3. Round ligament of each side divided about an inch (2.5 cm.) from the uterus, ends ligated and distal portion drawn backward through broad ligament and sutured to posterior surface of fundus uteri (Baldy, 1902). Later Baldy adopted the technique of not dividing the ligament, and by his writings and clear illustrations did much to popularize that method.

4. Round ligament of each side divided through a small peritoneal incision over it, the distal portion of the round ligament, without its peritoneal covering, drawn through the broad ligament and buried in a peritoneal cut on the posterior surface of the uterus (Alfieri).
5. Round ligament of each side divided through a small peritoneal incision over it, the distal portion drawn backward through the broad ligament and then drawn under the peritoneum of the posterior surface of the uterus to the median line, where it is fastened to the ligament of the opposite side (Schmitz, 1913).

IV. Transplantation of Round Ligaments into the Abdominal Wall.

The intra-abdominal portion of each ligament is drawn into the musculo-aponeurotic layer of the abdominal wall and fastened near the central incision (the central incision may be longitudinal or transverse). The various operations differ as to where the ligament leaves the peritoneal cavity or as to where the ligament enters the musculo-aponeurotic wall or as to where the ligament is fastened or as to how the work is executed.

A. Transperitoneal Transplantation, Leaving Free Bands.

a. Utilizes strong proximal portion of ligament for support.
b. Direction of pull is forward, hence the uterus and adnexa are held well forward and upward against even a strong backward tendency.
c. Gives two free bands in peritoneal cavity, with resulting possibility of intestinal obstruction.

1. Round ligament of each side is cut and ligated and the proximal portion is drawn through the posterior sheath of the rectus muscle (Ferguson, 1899).
2. Ligament, uncut, is drawn directly through peritoneum, rectus muscle and aponeurosis, about an inch (2.5 cm.) from the abdominal incision, by means of a ligature about the ligament and a forceps passed through a stab-wound in the rectus muscle. The ligament is fastened on the superior surface of the aponeurosis (Gilliam, 1900; Bardensen, 1904).
3. Same technique as Gilliam, except that upper sheath of rectus is not penetrated, the ligament being fastened underneath instead of above the aponeurosis (Ill, 1903; Branch, 1910).
4. Ligament, separated from its peritoneal covering, is brought out through a stab-wound of wall and fastened on the superior surface of the aponeurosis. The skin incision is transverse and exposes the external inguinal ring, through which the ligament is drawn out, to free it from the peritoneum. After

the abdomen is opened an incision is made in the peritoneum over the ligament about an inch (2.5 cm.) from the uterus, and through this the ligament is drawn into the peritoneal cavity, and then it is transplanted near the median incision by the stab-wound through the musculo-aponeurotic wall. (Pinkham, 1905.)

5. Ligament cut at distal end, then drawn through musculo-aponeurotic wall 1½ inches (4 cm.) from median incision, by means of pressure forceps thrust through the wall at that point, and fastened on upper surface of aponeurosis (Richardson, 1906).
6. Ligament caught a short distance from uterus and the loop brought through the peritoneum only, and fastened to the under surface of the posterior sheath of rectus muscle (Bumm, 1907).
7. Same as Gilliam technique except that a separate short incision through skin and fascia is made near the pubic spine (one on each side of the median incision), through which the musculo-aponeurotic wall is punctured and the ligament brought out (Strobell, 1912).
8. Ligament caught a short distance from the uterus with heavy braided silk doubled. The silk ligature is carried through the peritoneum, muscle and fascia of the abdominal wall and then back through the wall to the cavity, where it is firmly tied. The ligature gradually cuts through the ligament and abdominal wall tissues, giving firm scar-tissue union. (Graves' modification of the Olshausen fixation operation—see table, page 38.)

B. Transperitoneal Transplantation, Leaving no Free Band.

a. Utilizes strong proximal portion of ligament.
b. Direction of pull is forward.
c. Gives no free band in peritoneal cavity.

1. Addition to Gilliam technique of a lateral suture which closes space between distal portion of ligament and the abdominal wall. (Ferguson).
2. Ligament brought out through peritoneum close to the internal inguinal ring, about an inch (2.5 cm.) median to it, then along in the subperitoneal tissue to the rectus, out through rectus muscle and fastened to under surface of anterior rectus sheath. The work is most conveniently carried out by means of a special puncturing tenaculum-forceps, which enters at the median incision just below the upper sheath of rectus muscle, passes obliquely through rectus muscle into subperitoneal

space and then along in the subperitoneal space to near the internal inguinal ring. Here it punctures the peritoneum, then grasps the round ligament 1½ inches (4 cm.) from the uterus and brings it out along the forceps-track. (Crossen, 1907; Caballero, 1919; Adeodato, 1919.)

C. Subperitoneal Transplantation, with Lateral Pull.

a. Utilizes strong proximal portion of ligament.
b. Gives no free band in peritoneal cavity.
c. Direction of pull is lateral instead of forward, hence the displacement is likely to return if there is much backward tendency.
d. Ligament must have a long portion freely movable, to permit such extensive transplantation.

1. From the central longitudinal incision the skin and superficial tissues are pushed aside to the external inguinal ring, where the round ligament is found and drawn out as required, and fastened to upper surface of aponeurosis (Sandberg, 1905).
2. Round ligament is drawn between layers of broad ligament and out of abdomen through internal inguinal ring and along in wall to median incision, where it is fastened beneath the upper rectus sheath. A ligature is placed about round ligament 2½ inches (6 cm.) from uterus. A special curved ligature-forceps is passed from the median incision under upper rectus sheath out in the wall, through internal inguinal ring, along between layers of broad ligament and through peritoneum at temporary ligature about round ligament. The ligature is then grasped and drawn out, and by means of it the round ligament is drawn along the track. (Barrett, 1905. Later Dr. Barrett found it preferable to perforate the peritoneum at the internal inguinal ring.)
3. An abdominal section is made with a transverse incision, and from the ends of the transverse incision the round ligaments are drawn out along the inguinal canals (Peterson, 1906; Sweetnam, 1917).
4. Ligament brought into aponeurotic wall at internal ring, then along in wall for some distance and then into peritoneal cavity again, lateral to the median incision, where it is fastened. This is accomplished by means of a ligature about the round ligament, carried through the track made by a large, curved, blunt needle. (Dudley, 1906.)
5. From central incision (transverse if preferred) the skin and superficial tissues are stripped back to a point over the internal inguinal ring. Here a curved forceps is passed through the

aponeurotic wall and along between the layers of the broad ligament toward the uterus. The round ligament is grasped subperitoneally about 1½ inches (4 cm.) from the uterus, brought out through the aponeurosis and fastened to its superior surface. (Benjamin, 1909.)

D. Subperitoneal Transplantation, with Forward Pull.

a. Utilizes strong proximal portion of ligament.
b. Gives no free band in peritoneal cavity.
c. Direction of pull is forward.
d. There is extensive dissection of tissues of abdominal wall, with the attendant drawbacks, in those methods where the ligament is fastened securely in the musculoaponeurotic layer.

1. Round ligament drawn under peritoneum of broad ligament and abdominal wall to median incision, by means of a long pedicle-needle passed under the peritoneum from the median incision to the round ligament and then along between the layers of the broad ligament to emerge through a slit in peritoneum at round ligament, 1½ inches (4 cm.) from uterus. Here a ligature, previously tied about the round ligament, freed from its peritoneum, is threaded into the pedicle-needle and withdrawn, bringing the round ligament to the median incision, where it is fastened. (McGannon, 1902.)
2. Transverse incision through skin and aponeurosis to recti muscles, recti separated vertically and peritoneum incised for intra-abdominal work. Rectus sheath opened at outer end of transverse incision, finger introduced through this opening into the subperitoneal space to locate the round ligament subperitoneally and bring it out upon the rectus muscle, where it is fastened beneath the transverse incision in the aponeurosis. (Noble, 1903.)
3. Ligature is placed about round ligament an inch (2.5 cm.) from the uterus and both ends left long. A slit is then made in the peritoneum near the ligature and, by means of a large pedicle-needle, the ligature is carried into the peritoneal slit, outward between the layers of the broad ligament, along the abdominal wall just under the peritoneum and out into the peritoneal cavity 1½ inches (4 cm.) from the median incision. The round ligament is drawn under the peritoneum to this point and then one side of the ligature is threaded into an ordinary curved needle which is made to take a good bite of peritoneum, muscle and fascia, coming back into the cavity. Then the two sides of the ligature are tied together, securing the round ligament in this situation. (Simpson, 1903.)

4. Round ligament caught with temporary ligature which is threaded into a large pedicle-needle and carried, as in Simpson's technique, beneath the peritoneum of broad ligament and abdominal wall to outer margin of rectus muscle. Here the pedicle-needle is made to penetrate the aponeurotic wall, and the ligament is drawn out and fastened on the upper surface of aponeurosis. A transverse or longitudinal incision may be used as preferred. (Montgomery, 1904.)

5. Ligament transplanted in same tract as in Montgomery technique, but the ligament is brought out by means of a curved pressure forceps introduced from without through the aponeurosis and between the layers of the broad ligament (C. H. Mayo, 1906).

6. Round ligament caught by temporary ligature and a slit made in peritoneum near ligature. A large pedicle-needle is passed from median incision just under superior sheath of rectus, obliquely into subperitoneal tissue, then along under peritoneum of wall and broad ligament and out at the slit near ligature. By means of this pedicle-needle the ligature is drawn along the tract and then the ligament, which is fastened to the under surface of the aponeurosis. (Dicken, 1910.)

V. Plication of the Broad Ligaments. The broad ligaments, with the contained round ligaments, are shortened by excision or by folding laterally or by folding over the anterior surface or posterior surface of the uterus.

a. Leaves no free band in cavity.

b. Work is all intraperitoneal—hence no disturbance of the abdominal wall.

c. Dependence is largely on peritoneum, only the weaker portions of the round ligaments aiding in the support. The peritoneum is frail and loosely attached to the fixed walls of the cavity, therefore is not certain to prove effective against strong backward or downward tendency.

d. Direction of pull is largely lateral (broad and round ligaments folded), hence does not give the strong forward and upward pull obtained by transperitoneal transplantation of the round (and broad) ligaments.

1. Shortening of broad ligament of each side by excision of V-shaped piece in cases where adnexa are removed, or by incision and overlapping when adnexa are not removed (Bissell, Slocum, 1903).

2. Lateral folding of each round ligament and then purse-string suture taking up all slack in broad ligament (Harvie, 1910).
3. Repeated folding of the broad and round ligaments in front of the uterus—two or three superimposed folds being sutured to the anterior surface of the uterus (Coffey, 1904).
4. Same as Coffey technique except that the round ligaments are excluded from the sutures, which include peritoneum only (Abbott, 1910).
5. A single fold of broad and round ligament of each side is brought to the median line of the anterior surface of fundus uteri, near the top, and sutured there. Then the suture is continued downward in a way to fasten the folds together and to the anterior surface of the uterus. (Willis, 1912.)
6. A single fold of broad and round ligament of each side is brought over the top of the fundus uteri and sutured posteriorly, and also sutured down over the front of the fundus (Kime).
7. Folding of the broad ligaments over the back of the uterus and suturing of the same in that position (Venable, 1910).
8. Shortening of the broad ligament of each side by ligation and excision of the pampiniform plexus and folding and suturing of the infundibulo-pelvic ligament (Kuhn, 1913).

VI. Shortening of Utero-sacral Ligaments Through the Abdominal Incision.

a. Draws the cervix uteri well back and upward in the pelvis, which is an important consideration in cases in which the cervix comes far forward.

b. When used alone it does not satisfactorily elevate the fundus uteri and adnexa. It is used, when necessary, in combination with some anterior operation for holding the fundus forward.

1. Dissection of utero-sacral ligaments free from peritoneum, and shortening of same (Bovée, 1902; Stoner, 1903).
2. Simple folding of utero-sacral ligaments by suture after scarification (Noble, 1912).
3. Fastening of folded utero-sacral ligament of each side into subperitoneal tissue of uterine wall (Young, 1919).
4. Shortening of utero-sacral ligaments through abdominal incision, and in addition, suturing the cervix uteri to the posterior wall of Douglas' pouch (Bishop, 1903).

VII. Miscellaneous Procedures.

1. Marion Sims, in 1859, decided to try to suture the uterus to the anterior abdominal wall without incision. He constructed a

special hollow needle carrying a silver wire. He began the operation, but did not finish it, stopping doubtless because of the evident danger.

2. Incision of the abdominal wall to the peritoneum and then passage of silver wire sutures through the fundus uteri, which was pushed up firmly against the unopened peritoneum. This dangerous procedure was successfully carried out several times (Kaltenbach).

3. Temporary ventro-suspension, by means of a double ten-day catgut suture, taking a bite of the posterior part of the fundus uteri and catching the peritoneum, muscle and fascia of the abdominal wall an inch below the lower angle of the abdominal incision—the suture to be tied just tight enough for approximation, but not tight enough to cause adhesion of the approximated peritoneal surfaces (Ochsner, 1909).

4. Fastening of fundus uteri forward by suturing to it a flap of peritoneum raised from the vesico-uterine junction (Pestalozzi, 1910).

5. Suspension of the uterus by a subperitoneal suture extending along the round ligaments and back of the uterus (Buteau, 1913). A separate suture is used on each side. The distal end is fastened securely to the muscle and fascia at the internal inguinal ring, the suture is passed along the round ligament, mainly subperitoneally, to near the uterus, then through the broad ligament just below the ovarian ligament, then under the peritoneum of the posterior surface of the uterus to the median line, where the two sutures are tied together, after the uterus has been brought into proper position.

6. Reënforcement of weak round ligaments by catgut suture or by fascial strip (Coughlin, 1913; Du Bose, 1920). In one case a chromic catgut suture, doubled, was passed from the abdominal incision, along the inguinal canal; then between the layers of the broad ligament, along the round ligament to the uterus; then back of the uterus, subperitoneally; then along between the layers of the other broad ligament and out through the other inguinal canal. As the round ligaments were shortened, this doubled suture was tied and served to keep the uterus well forward. In another case a strip of fascia on each side, cut from the aponeurosis at the edge of abdominal incision and still attached at its lower end, was made to traverse the same course as the catgut suture in the first case did, to the posterior surface of the uterus, where the end of the strip was fastened after the round ligament had been shortened.

7. The Fallopian tube and proximal 2 inches (5 cm.) of round ligament on each side, were severed from the remaining part of the broad ligament and brought through a stab-wound of rectus muscle and aponeurosis, and fastened there. The operation was to correct retrodisplacement and produce certain sterility (Stetten, 1913).

C. Through the Vagina. The vaginal operations in general have the advantage that they are easily combined with the vaginal work, previously mentioned as necessary in a considerable proportion of the cases of retrodisplacement. Again, there is less handling of peritoneal surfaces and, consequently, less shock and less danger of peritonitis.

On the other hand they have the disadvantage that they do not provide for satisfactory elevation of the fundus uteri and adnexa or for the decided pull forward and upward that is necessary when there is a strong backward tendency. Again, pathological conditions in the pelvis, and particularly in the lower abdomen cannot be so well determined or so safely and accurately treated.

I. Attempts to Fasten Cervix Uteri in the Posterior Part of Pelvis.

1. Cauterization (by caustic potash or actual cautery) of the posterior vaginal vault and adjacent surface of cervix, to cause firm adhesions between these surfaces and thus hold the cervix well back (Amussat, 1850).
2. Suture of cervix to posterior vaginal vault (Herrick, 1883; Nicoletus).
3. Shortening of the posterior vaginal vault by making a longitudinal incision and closing it transversely, and lengthening of anterior vault by making a transverse incision and closing it longitudinally (Schücking, 1900).
4. Denudation of posterior vaginal vault and adjacent surface of cervix, and uniting of same by suture (Goelet, 1903).
5. Incision in posterior vaginal vault, culdesac opened, peritoneal surfaces roughened and a gauze drain left in to cause adhesions and thus hold cervix well back (Pryor).

II. Vagino-fixation of Uterus. Sutures are passed through the anterior vaginal wall and through the front of the corpus uteri, thus fastening the two together and holding the uterus forward.

a. Fixes the fundus uteri well forward and throws the cervix backward.
b. Does not provide for satisfactory elevation of the uterus and adnexa.
c. Uncertainty of ultimate results. As formerly carried out it caused serious trouble in pregnancy. Improvements in

the technique have lessened this danger, but have not eliminated it entirely.

When the uterus is fastened forward securely enough to insure its staying there, an excessive amount of scar may form and cause trouble in pregnancy. On the other hand, when the operation is so conducted as to practically eliminate this danger, the fixation is likely to be insecure and there may be return of the displacement.

1. Suture of corpus uteri to anterior vaginal wall, without incision (Sänger, 1888; Schücking, 1889, special needle). Soon dropped because of danger to bladder.
2. Longitudinal incision of anterior vaginal vault, separation of bladder from cervix and passing of fixation suture just above the level of the internal os, uniting uterine wall to vaginal wall (Mackenrodt, May, 1892).
3. Transverse incision of anterior vaginal vault, separation of bladder from cervix and passing fixation suture higher, above level of internal os (Dührssen, July, 1892).
4. Addition to Mackenrodt technique of (a) higher point for fixation sutures, and (b) anterior colporrhaphy, to make a stronger anterior vaginal wall and a better fixed point for uterine fixation sutures (Winter, 1893).
5. Extension of Mackenrodt operation by the routine opening of the vesico-uterine peritoneal pouch, and various ways of fixing uterus to vagina (Küstner, 1894; Dührssen, 1894; Vineberg, 1894; McCann, 1902).
6. Elevation of the cervical attachment of the utero-pubic fascia so as to bring the attachment well above the pivotal area of the uterus (Bovée, 1897). Vagino-fixation by the later methods accomplishes much the same result.
7. Lengthening of the anterior vaginal wall, which in some cases is so short as to prevent satisfactory posterior replacement of the cervix (Schücking, 1900; Boveé, 1902.

III. Vesico-fixation. The peritoneal cavity is opened by anterior vaginal section and the fundus uteri is brought forward and sutured to the vesical peritoneum.

a. Fundus brought well forward.

b. Does not provide for satisfactory elevation of the uterus and adnexa.

c. The peritoneal adhesions are likely to stretch and permit return of the displacement.

IV. Shortening the Round Ligaments Through Vaginal Incision.

a. Brings fundus uteri forward.
b. Does not provide for satisfactory elevation of uterus and adnexa.
c. Uterus is suspended by the weak portion (distal portion) of the ligaments.
d. Direction of pull is lateral instead of forward.

1. Vaginal shortening of round ligaments by folding them in various ways (Godinho, 1896; Vineberg, 1896; Wertheim, 1896; Bode, 1896; Byford, 1896; Goffe, 1897).
2. Folded portion of each round ligament buried in a transverse tunnel in the anterior wall of the fundus uteri (Ries, 1901).
3. Fundus uteri brought down through anterior vaginal incision and round ligament of each side drawn backward through broad ligament and fastened posteriorly (Webster, 1901).

V. Ventral Suspension of Uterus Through Vaginal Incision.

a. Brings fundus uteri forward.
b. Provides satisfactory elevation by the upward and forward pull.
c. Carries the disadvantages of ventro-suspension per abdominal incision.
d. Does not permit of as satisfactory examination or treatment of higher pelvic lesions.

1. Ventral fastening of the uterus by suturing the round ligaments to the anterior abdominal wall, through an anterior vaginal incision (Wertheim, 1896).
2. Ventral fastening of uterus by suturing the fundus uteri directly to the anterior abdominal wall, through an anterior vaginal incision (Ferguson, 1902).

VI. Anterior Coaptation of the Broad Ligaments Through Vaginal Incision. The bladder is separated from the uterus, as in anterior vaginal section, and then the strong tissues in the lower part of each broad ligament are brought together in the median line in front of the cervix and sutured there.

a. Cervix is elevated and held well back in the pelvis. This is sufficient in some cases to keep the fundus uteri forward and to lessen the dragging enough to relieve the symptoms.
b. It does not strongly elevate the fudus and adnexa.
c. Like the other vaginal operations, it fails to provide for thorough exploration and operative treatment of pathological conditions in the pelvis and lower abdomen.

1. Lower portion of broad ligaments folded in front of cervix and sutured together there (Alexandroff, 1903).
2. Lower portion of broad ligaments severed from cervix and sutured together in front of same (Hertzler, 1906; E. C. Dudley, 1906).

VII. Shortening of Utero-sacral Ligaments per Vaginam.

a. Draws cervix well back and upward and throws fundus forward.

b. Does not satisfactorily elevate the fundus uteri and the adnexa.

c. Tubal and appendiceal complications cannot be so satisfactorily determined nor so accurately treated.

1. Shortening of utero-sacral ligaments by submucous suture. The cervix was pulled forward until the ligaments could be felt and the shortening suture was passed by touch without incision (Byford, 1888).
2. Shortening of utero-sacral ligaments through posterior vaginal incision (Kelly, 1888; Herrick, 1891; Sänger, 1891; Gottschalk, 1896; Bovée, 1897).
3. Shortening of utero-sacral ligaments and then obliteration of the Douglas pouch by adhesive inflammation, by the use of iodoform packing (Freund, 1889).
4. Breaking of adhesions and anteversion of uterus through posterior vaginal section and then shortening of the utero-sacral ligaments (Frömmel).
5. Shortening of the utero-sacral ligaments and of the round ligaments per vaginam (Godinho, 1896).
6. Utero-sacral ligaments severed from uterus posteriorly and brought forward under broad ligaments, and sutured together in front of cervix, through a circular incision about the cervix (Jellett, 1911).
7. Utero-sacral ligaments drawn forward through the broad ligaments and sutured in front of cervix. Wagner severed the ligaments posteriorly before drawing them forward while Martin simply caught them with a forceps and drew them through uncut.

TECHNIQUE OF OPERATIONS.

In the preceding table a general idea is given of the various methods and modifications. The detailed description of technique covers only methods which have been so far perfected as to be considered of practical use today. In taking up each of the various methods, the author has selected as representative of that method, that operation which seems to him most useful, giving

the variations in execution incidentally under the various steps or in a following description.

In most cases of retrodisplacement requiring operation, there are accompanying lesions needing intraperitoneal treatment. Consequently, the operations of which abdominal section is a part will be considered first. The various operative measures will be described in the following:

A. Through a Central Abdominal Incision.

I. Transperitoneal transplantation of round ligaments, leaving free bands in peritoneal cavity.
II. Transperitoneal transplantation of round ligaments, leaving no free band in peritoneal cavity.
III. Subperitoneal transplantation of round ligaments, with forward pull.
IV. Subperitoneal transplantation of round ligaments, with lateral pull.
V. Posterior implantation of round ligaments.
VI. Lateral folding of round ligaments.
VII. Ventral suturing of round ligaments.
VIII. Ventro-fixation of fundus uteri.
IX. Ventro-suspension of fundus uteri.
X. Anterior plication of broad ligaments.
XI. Posterior plication of broad ligaments.
XII. Abdominal shortening of utero-sacral ligaments.

B. Through the Inguinal Canals.

XIII. Extraperitoneal shortening of round ligaments, through long incisions.
XIV. Extraperitoneal shortening of round ligaments, through very short incisions.
XV. Extraperitoneal transplantation of round ligaments, giving forward pull.

C. Through the Vagina.

XVI. Vagino-fixation of uterus.
XVII. Vaginal shortening of round ligaments.
XVIII. Vaginal shortening of utero-sacral ligaments.
XIX. Elevation of cervical attachment of utero-pubic ligament.
XX. Lengthening of anterior vaginal wall.

A. THROUGH CENTRAL ABDOMINAL INCISION.

I. Transperitoneal Transplantation of Round Ligaments, Leaving Free Bands in Peritoneal Cavity.

(GILLIAM TECHNIQUE.)

After the other intra-abdominal work has been finished, the uterus is fastened forward by the following steps:

1. On each side, the round ligament is picked up with a bullet forceps, a temporary ligature is placed about it, 1½ inches (4 cm.) from the uterus, and the ends of the ligature are caught in a forceps (Fig. 1).

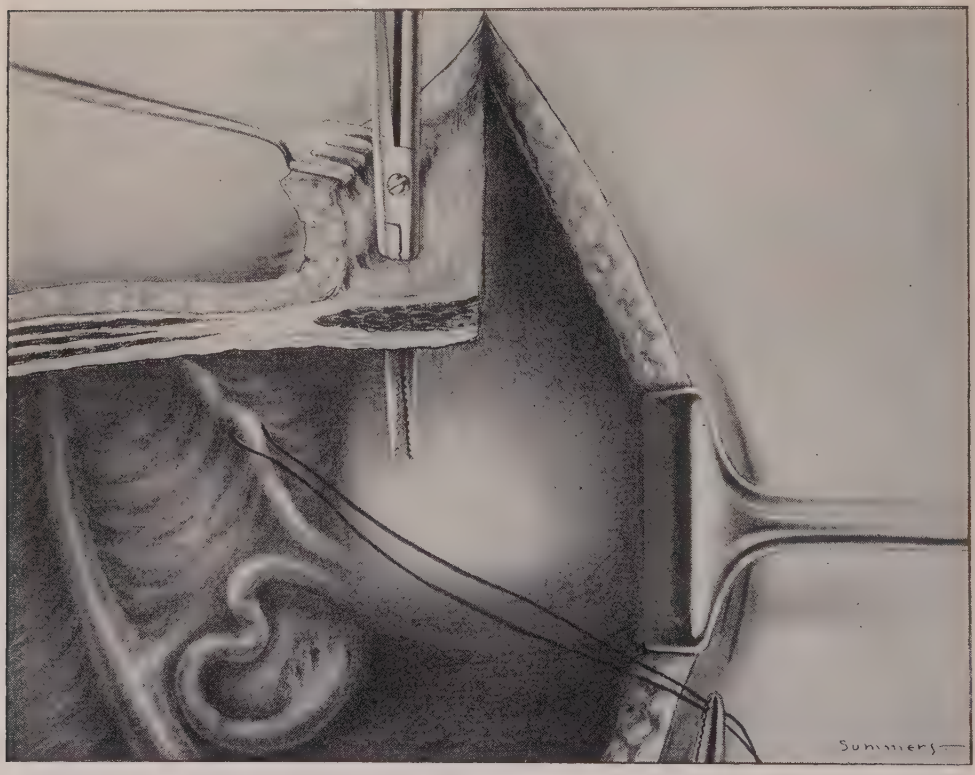


Fig. 1. Transperitoneal Transplantation of Round Ligaments, leaving Free Bands (Gilliam technique). The temporary ligature has been placed about the left ligament 1½ inches (4 cm.) from the uterus. The perforating forceps has been introduced through the aponeurosis, muscle, and peritoneum, 1½ inches (4 cm.) above the pubic bone, and is ready to grasp the temporary ligature.

2. The peritoneum, muscle and overlying aponeurosis of one side of the abdominal incision are grasped and held firmly with a tenaculum-forceps at a point about 1½ inches (4 cm.) above the pubic bone. The skin and fat are then retracted, using a knife if necessary to bare the aponeurosis.

3. With a narrow-bladed knife a stab-wound is then made through the aponeurosis, muscle and peritoneum into the cavity, at a point 1 inch (2.5 cm.) from

the margin of the incision and 1½ inches (4 cm.) above the pubic bone. Through this stab-wound an artery forceps is introduced and the thread about the round ligament grasped and brought out, bringing the ligament with it. If preferred, a sharp-pointed forceps may be used to make the stab-wound and grasp the ligature (Fig. 1).

4. The loop of each ligament is drawn through (Fig. 2) until the fundus uteri rests well forward. The loop of each side is then sutured securely to the aponeurosis by catgut, as indicated in Fig. 3. The ends may be fastened as desired. Gilliam's perforating forceps is shown in Fig. 4. Fig. 5 shows an instrument devised by W. M. Goodwin for the Gilliam operation.

5. The abdominal incision is then closed in the usual way.

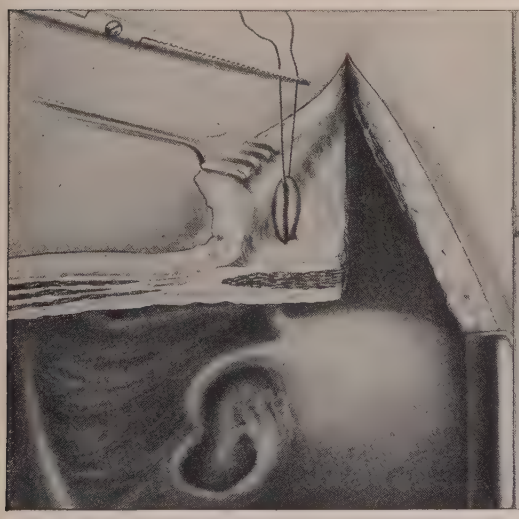


Fig. 2.

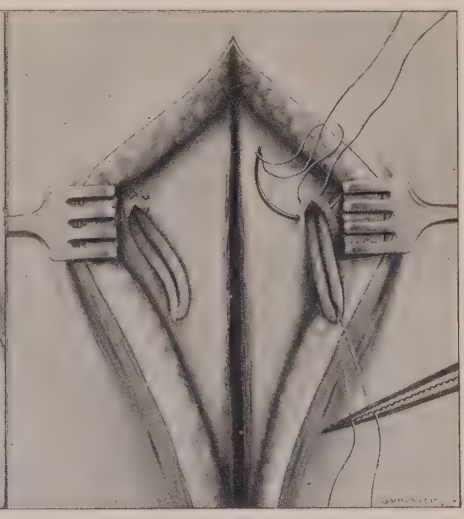


Fig. 3.

Fig. 2. The ligature grasped and brought out and the loop of ligament drawn through, transplanting the ligament to its new location in the abdominal wall. The ligament on the other side is brought out in the same way, and then the ligament-loops are fastened by chromic catgut in any manner preferred.

Fig. 3. Fastening the ligament-loops on the superior surface of the aponeurosis. The fastening suture should include only half the thickness of the ligament, so as to avoid interfering with the blood supply of the ligament-loop. Also, the opening in the aponeurosis should not be closed so tightly that the reparative swelling interferes with the circulation, with possible consequent sloughing.

This operation has stood the test of time and has proved a most excellent one. The uterus is held forward by strong, dependable tissues—namely, the strong portion of the round ligaments. The pull of the ligaments is changed from lateral to forward, so that even a strong backward tendency is counterbalanced. The tubes, and ovaries also, are raised by this method, this effect being enhanced by the fact that more or less broad ligament is drawn into the abdominal wall along with each round ligament. Occasionally, however, the prolapse of the ovary is so marked that shortening of the utero-ovarian ligament also is advisable. During

pregnancy the round ligaments hypertrophy along with the uterus, and undergo involution after delivery.

At first there was suppuration about the ligament-loop in quite a proportion of cases, but this has disappeared under improved technique. On this point Dr. Gilliam remarks: "Of late I have had no suppuration. This I ascribe to the fact that I handle the ligament as little as possible, and never touch it with my fingers after it has been drawn into place, and also to the fact that I clip the suspending thread close to the ligament, so as to avoid contamination by drawing it full length through the loop of the ligament after its exposure on the abdominal wall." Rubber gloves should of course be worn as a safeguard in all the manipulations of the operation. An important point, also, is to make the opening in the firm

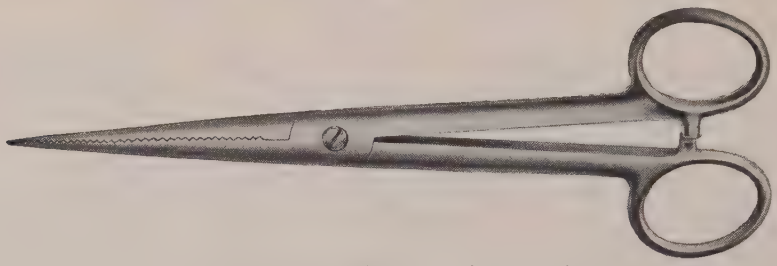


Fig. 4. Perforating Forceps (Gilliam), for grasping the ligature.

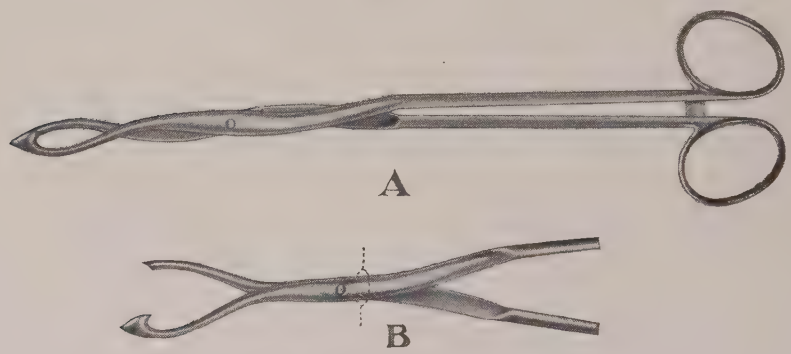


Fig. 5. Perforating Forceps (Goodwin), for grasping the ligament in the Gilliam operation. A. Forceps closed. B. Forceps open.

aponeurosis, through which the ligament is drawn, large enough so that the reparative swelling does not cause injurious constriction and consequent sloughing of the drawn-out loop. Another point is to avoid placing the retaining suture in such a way that, when tied, it constricts the whole ligament and thus cuts off the circulation of the outside loop.

The opening on each side between the inguinal ring and the new point of exit has been considered a source of danger, in that it might cause intestinal obstruction by a loop of intestine (a) slipping through the opening and becoming constricted by the sides, or (b) wrapping around the free band formed by the ligament in passing to its new point of exit. This may be avoided by the use of the Ferguson puckering suture (Fig. 22) or, more simply, by making the

puncture in the peritoneum well out toward the inguinal ring, as in the operative method next described.

Again, the loop of ligament on the superior surface of the aponeurosis, just under the skin, forms a small lump which is more or less tender in many cases and becomes quite annoying in some. This may be avoided by keeping the loops of ligament under the aponeurosis, as in the method next described.

II. Transperitoneal Transplantation of Round Ligaments, Leaving No Free Band in Peritoneal Cavity.

(CROSSEN-GILLIAM TECHNIQUE.)

1. The other intra-abdominal work having been completed, the round ligament on one side is grasped about its middle (Figs. 6, 16). The peri-

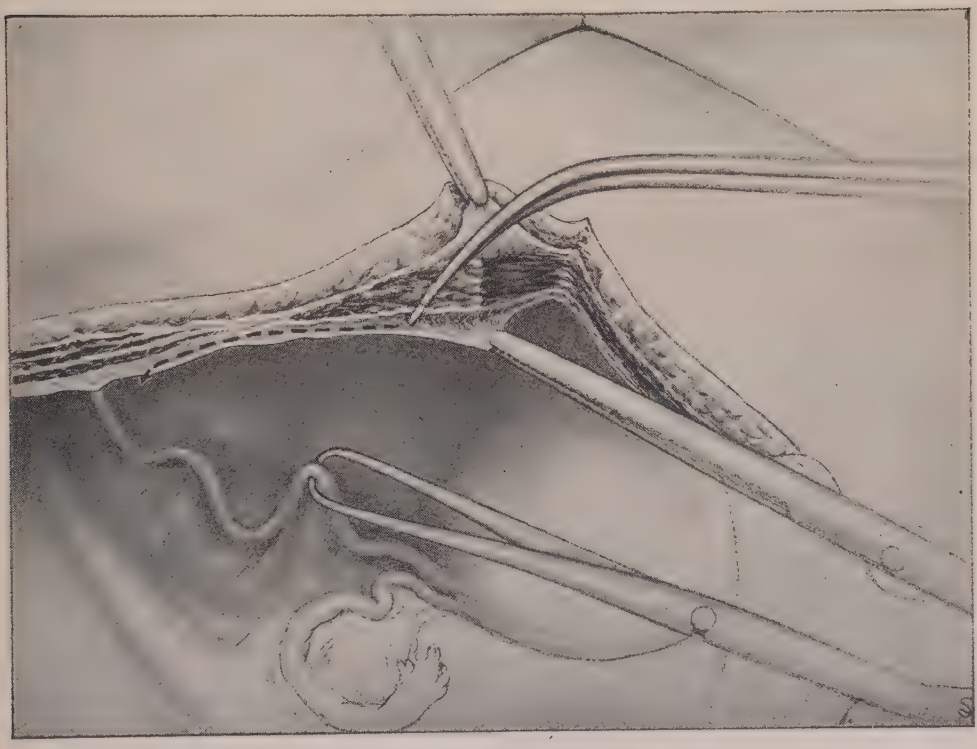


Fig. 6. Transperitoneal Transplantation of Round Ligaments, leaving no Free Band (Crossen-Gilliam technique). The round ligament is grasped with a forceps (pressure forceps or tenaculum forceps as perferred) at the middle. The aponeurosis is then grasped and raised and the peritoneum also is separated from the muscle, as here shown. The special puncturing tenaculum-forceps is pushed through the muscle so that the point appears below as shown in Fig. 7, and the forceps point is then carried along under the peritoneum as indicated by the heavy broken line above.

toneum at the internal ring is then caught with a forceps as a marker as shown in Fig. 16.

2. The aponeurosis and peritoneum are then grasped with forceps about one inch (2½ cm.) above the pubic bone, and separated from the muscle (Figs. 6, 7), and a forceps is passed through a portion of the muscle as

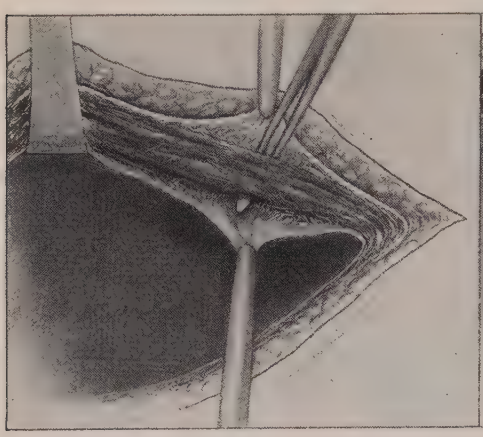


Fig. 7.

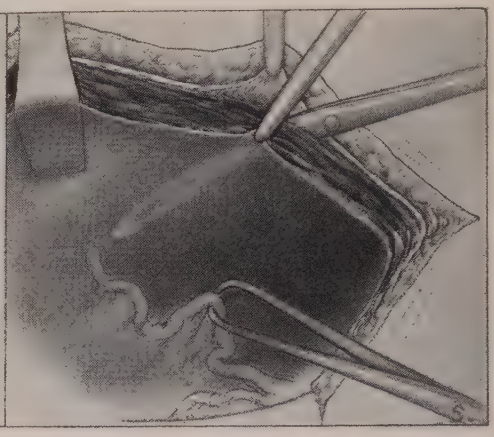


Fig. 8.

Fig. 7. The forceps introduced through the muscle to the peritoneum. Seeing the point, as here indicated, makes certain that it is through all tissue but the peritoneum.

Fig. 8. The forceps carried along under the peritoneum to the point for puncture. In order to eliminate special instruments the author now uses an ordinary curved pedicle clamp for this purpose, as shown in Fig. 16.

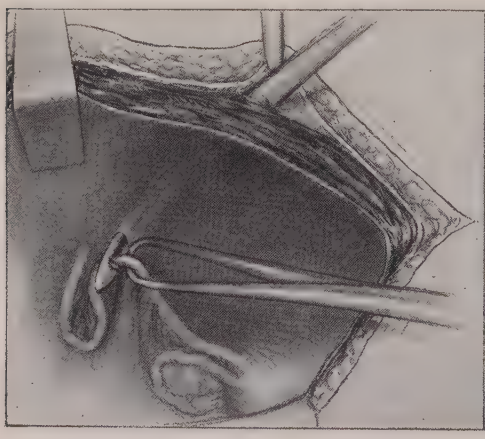


Fig. 9.

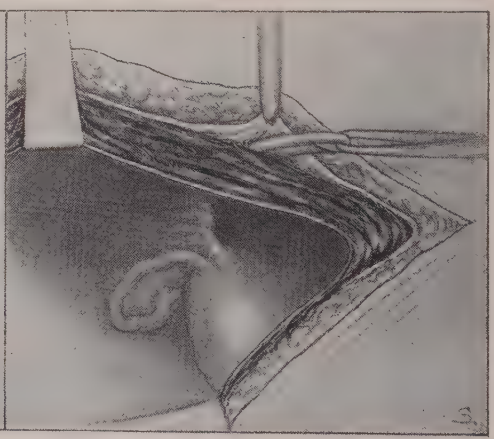


Fig. 10.

Fig. 9. The peritoneum punctured and the round ligament grasped preparatory to drawing it into the abdominal wall.

Fig. 10. The ligament drawn into the abdominal wall along the forceps tract and out under the aponeurosis.

indicated in Figs. 6 and 7. For this purpose an ordinary pedicle forceps may be used in place of the puncturing tenaculum forceps (see Fig. 16).

3. With two fingers in the peritoneal cavity the bladder is pushed down

out of the way and, under the guidance of these fingers, the forceps-point is carried along under the peritoneum to the marker-forceps near the internal ring (Figs. 6, 8, 16). Here the peritoneum is punctured between the two guiding fingers, and the round ligament is grasped at its middle and drawn into the abdominal wall along the forceps track (Figs. 9, 10, 16, 17).

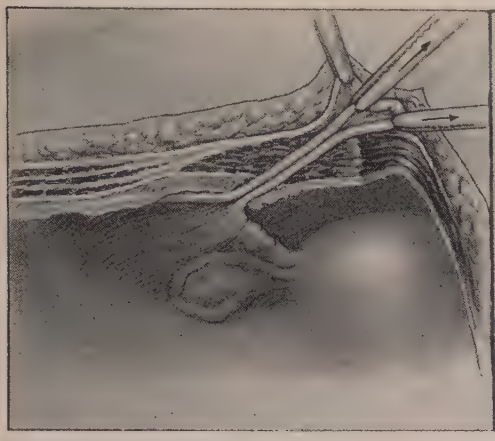


Fig. 11.

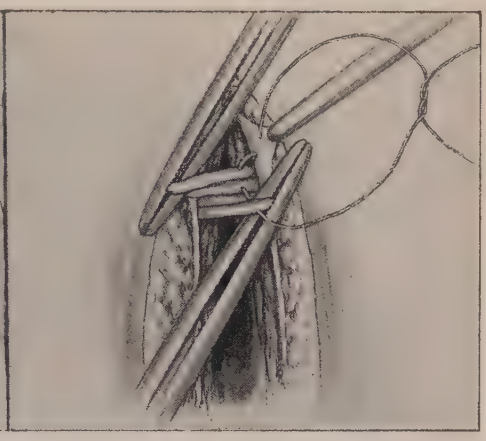


Fig. 12.

Fig. 11. Taking up all slack in each arm of the ligament. Drawing the uterine arm taut brings the uterus forward, while drawing the outer arm taut obliterates any opening between the ligament and the wall.

Fig. 12. Suturing the ligament-loop to the under surface of the aponeurosis. Care must be taken to suture each taut arm of the ligament securely to the aponeurosis, as indicated in Figs. 13 and 17.

Fig. 13.

Fig. 14.

Fig. 13. Fastening the ligament-loops to the under surface of the aponeurosis. If long enough the loops may be crossed over the median line. The fastening sutures should not include the whole thickness of the ligament at any point. For suture material the author prefers chromic catgut, as silk or linen sometimes cause trouble, as mentioned in the text.

Fig. 14. The transplantation completed, showing the location of the new exits and the forward pull of the shortened ligaments. In closing the peritoneal wound, it is well to draw the lower angle up above the uterus, as indicated by the arrow on the forceps-point.

4. Each arm of the ligament is then drawn taut as indicated in Figs. 11 and 17, to bring the fundus uteri well forward and to eliminate any opening between the distal portion of the ligament and the abdominal wall, and each arm is then securely sutured to the under surface of the aponeurosis (Fig. 17). Long-lasting chromic catgut or fine silk or linen may be used. The

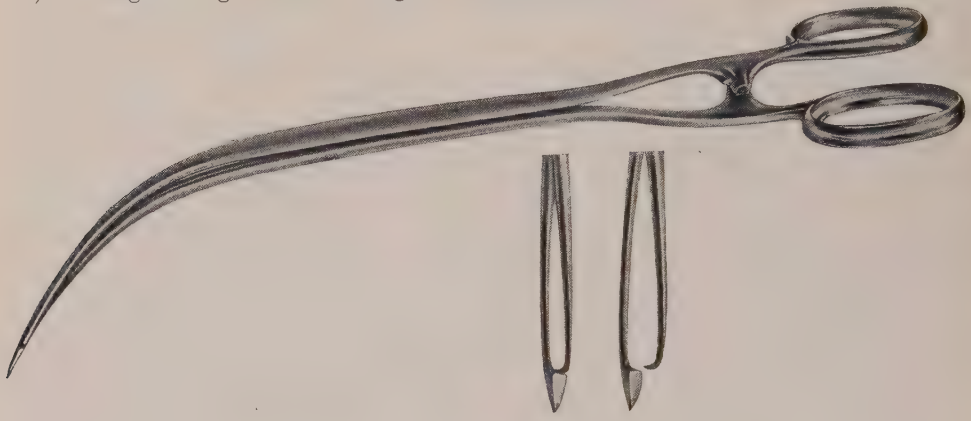


Fig. 15. Puncturing Tenaculum-Forceps (Crossen). There should be no sharp point or sharp edge. A sharp point or edge is unnecessary and may cause a hematoma by wounding some small vessel in the wall. In order to eliminate special instruments the author now usually uses an ordinary pedicle clamp for this purpose, as explained in the text and in Fig. 16.

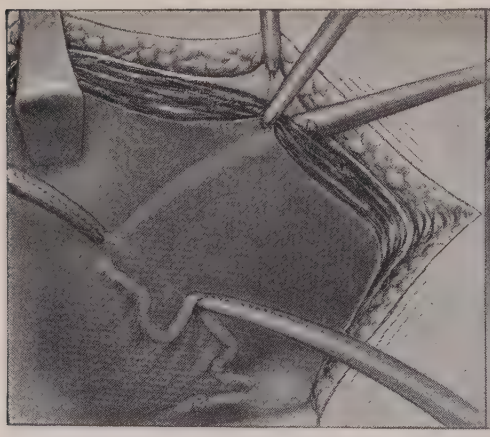


Fig. 16.

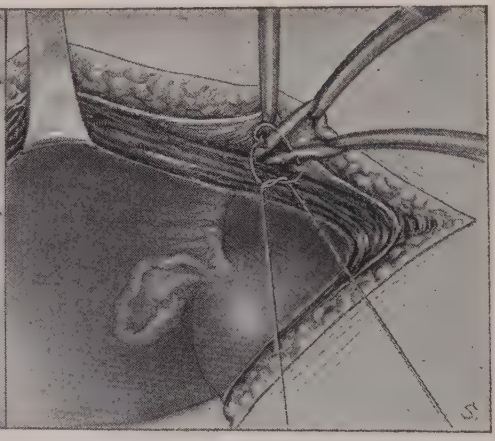


Fig. 17.

Fig. 16. Executing the operation with an ordinary pedicle clamp, as explained in the text. The marker forceps, grasping the peritoneum at the site of intended puncture of the peritoneum, is very helpful in the accurate execution of the work by touch.

Fig. 17. Suturing each limb of the ligament-loop securely to the under surface of the aponeurosis. Chromic catgut (forty day, No. 2) is used for this purpose.

author prefers the chromic catgut (40 day, No. 2) as the nonabsorbable sutures sometimes cause later trouble. In one of his cases a linen suture caused trouble more than a year after the operation.

5. The round ligament of the other side is then transplanted in like manner.

6. In closing the abdominal incision, fasten each free loop across the median line, as indicated in Figs. 12 and 18, the extent of the overlapping

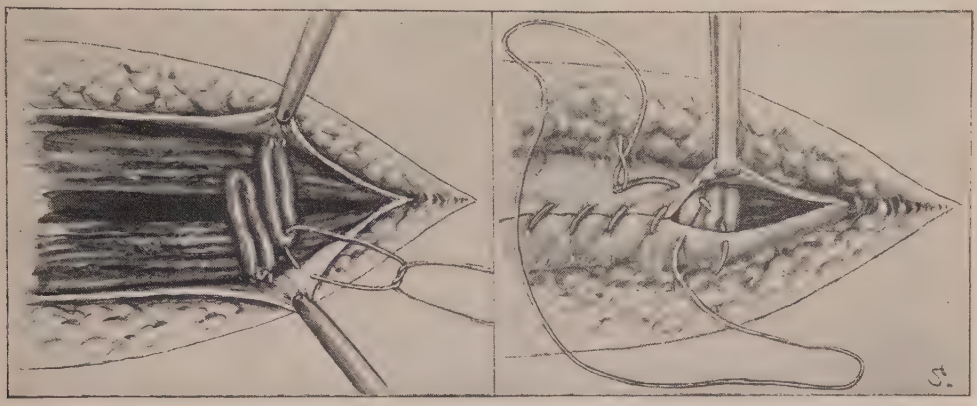


Fig. 18. Fig. 19.

Fig. 18. Where the ligament-loop is long enough after suturing to the aponeurosis on that side, it is well to suture the tip to the aponeurosis of the opposite side, as here indicated.

Fig. 19. Where the excess ligament-loops are too short to be fastened securely across the median line, they may be caught in the aponeurotic closing suture as here indicated.

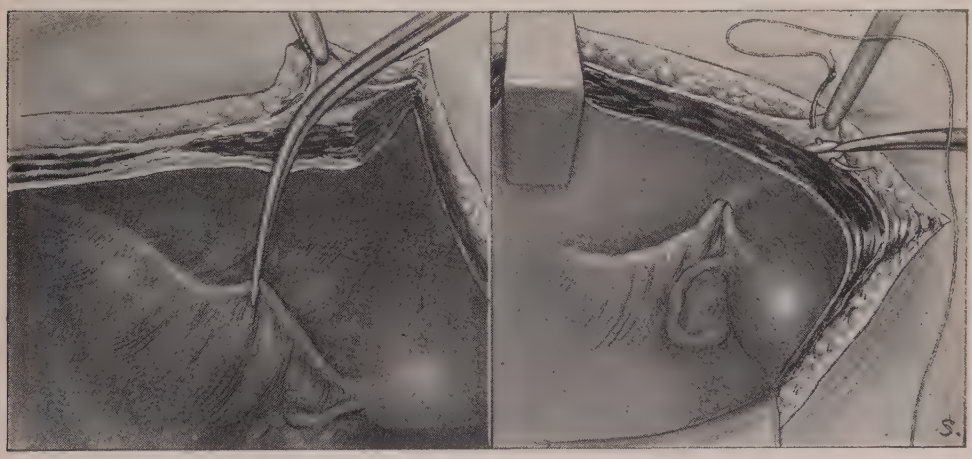


Fig. 20. Fig. 21.

Fig. 20. Transplantation of short fixed ligaments. The ligament caught with a forceps preparatory to drawing it into the wall.

Fig. 21. The short ligament drawn into the wall, and the loop being sutured to the under surface of the aponeurosis.

depending on the length of the loops. Additional fastening may be secured if desired by catching each loop with the closing aponeurotic suture, as shown in Fig. 19.

By the method here detailed the ligaments may be transplanted into the abdominal wall conveniently and quickly—giving a strong, reliable forward and upward traction to the uterus and adnexa, without free bands or dangerous adventitious openings (Fig. 14). The peritoneum being freely movable, on account of the loose subperitoneal tissue, slips inward to the new muscular exit, giving a good forward direction to the shortened ligament. When the abdominal incision is closed the ligament loops lie under the aponeurosis where they are protected from outside pressure.

The operation as first worked out in 1907 required a special puncturing tenaculum-forceps (Fig. 15). However, as the details were gradually perfected the author worked towards simplicity and the elimination of special instruments, and he has now succeeded in devising a technique by which the operation is carried out with a regular pedicle forceps. Following the detailed directions already given, the pedicle forceps is passed along the special

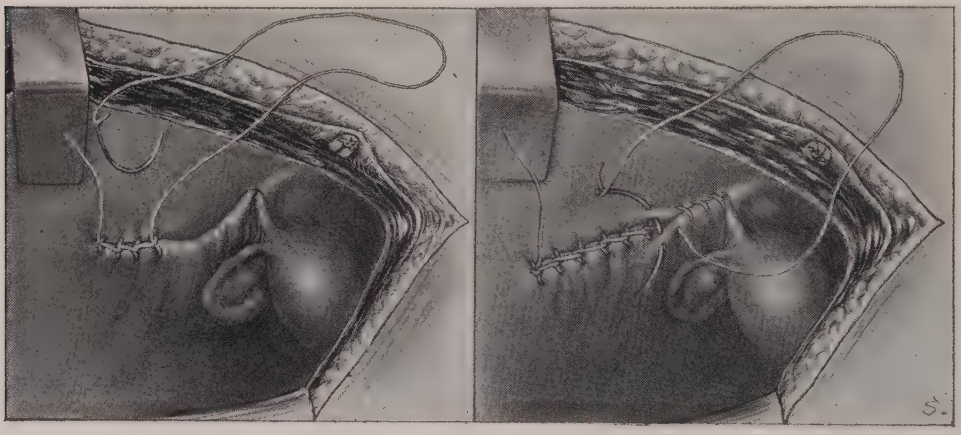


Fig. 22. Fig. 23.

Fig. 22. Closing the dangerous lateral opening between the ligament and the wall.
Fig. 23. Completing the secure closure of the lateral opening.

course shown in Figs. 6 to 9. Figs. 16 and 17 show certain steps being executed with the ordinary forceps.

In certain cases the round ligaments are too short or too much fixed by broad-ligament infiltration to be drawn into the wall in the regular way. In such a case a portion of each ligament near the uterus may be drawn directly through the peritoneum and muscle, as shown in Figs. 20 and 21. The opening which this leaves between the ligament and the abdominal wall externally is to be securely closed by suturing the other portion of the ligament to the wall, as suggested by Ferguson. It is advisable to use chromic catgut for this suturing and to put in two rows as indicated in Figs. 22 and 23. This suturing should be very complete and secure, otherwise straining may separate the surfaces and force an intestinal loop through a very small opening, with resulting intestinal obstruction.

A modification of the Gilliam operation, somewhat similar to the above, has recently been proposed by Caballero (Surgery, Gynecology and Obstetrics, Aug., 1919) and also by Adeodato (Brazil-Medico, 1919, 33, No. 12). Both these operators bring the round ligaments into the abdominal wall farther from the median line than Gilliam, in order to avoid the chance of hernia between the ligament and the wall. But each seems to have missed the important point of making the puncture in the musculo-aponeurotic wall near the median line and the puncture in the peritoneum far out near the internal inguinal ring. It is this maneuver which obliterates the lateral hernia-producing space and at the same time gives a strong forward pull practically as in the original Gilliam operation.

III. Subperitoneal Transplantation of Round Ligaments, with Forward Pull.

(SIMPSON-MONTGOMERY TECHNIQUE.)

1. After completion of the other intra-abdominal work, through either a longitudinal or transverse incision, a ligature is passed about each round ligament 1½ inches (4 cm.) from the uterus and the ends of each ligature left long.

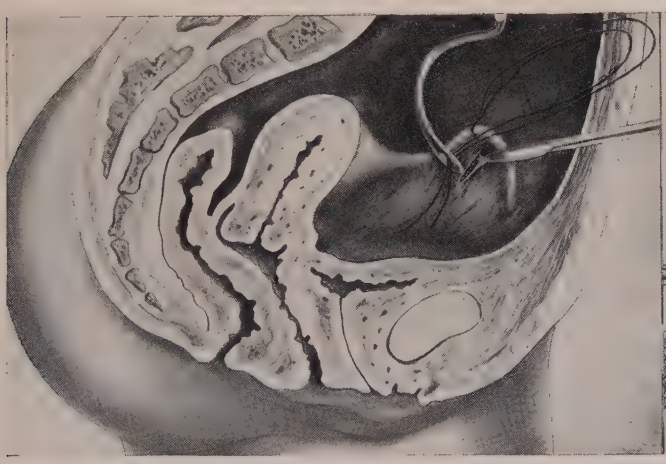


Fig. 24.

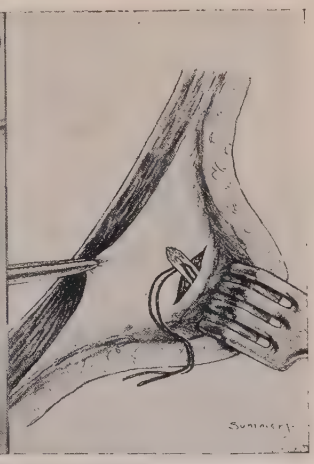


Fig. 25.

Fig. 24. Subperitoneal Transplantation of Round Ligaments, with Forward Pull (Simpson-Montgomery technique). The temporary ligature threaded into the pedicle-needle preparatory to being carried between the layers of the broad ligament and through the abdominal wall.

Fig. 25. The point of the pedicle-needle projecting through the small slit made in the aponeurosis near the outer edge of the rectus muscle. The ligature is to be freed from the pedicle-needle and the needle is then withdrawn.

2. On one side a small opening is made through the peritoneum anterior to and just below the round ligament at the point where the ligature is located. Then the ends of the ligature are threaded into the eye of a large pedicle-needle

(Fig. 24) and by means of the pedicle-needle the ligature is carried into the broad ligament (through the small opening mentioned), along in the broad ligament and then along the abdominal wall just under the peritoneum until near the outer edge of the rectus muscle. Up to this point the technique is that of Simpson, described in 1903 (see table, page 45). Montgomery (1904) used the same,

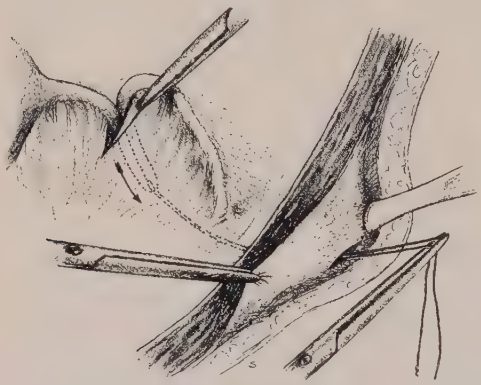


Fig. 26.

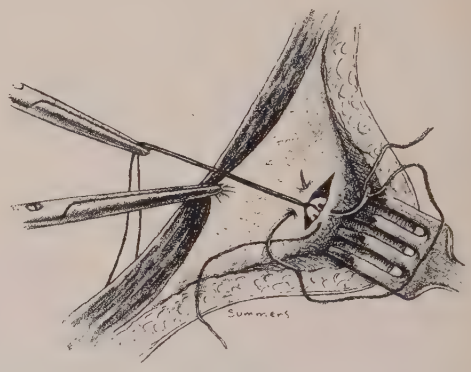


Fig. 27.

Fig. 26. The ligature caught in a forceps. By means of this ligature the round ligament is being drawn into the abdominal wall.

Fig. 27. Fastening the ligament-loop in the slit in the aponeurosis. Care should be taken to make secure fastening, with chromic catgut or silk as preferred.

Fig. 28.

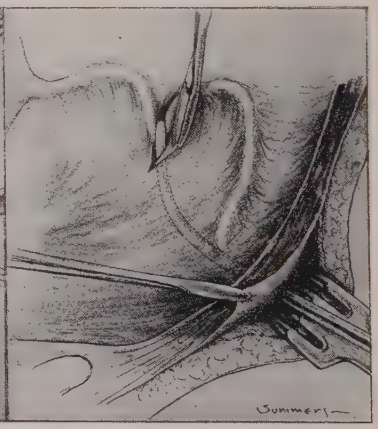


Fig. 29.

Fig. 28. Forceps-technique (Mayo) for subperitoneal transplantation with forward pull. Forceps introduced and grasping a temporary ligature, preparatory to bringing it out.

Fig. 29. If preferred the forceps may grasp the ligament direct, as indicated here. When brought out, the ligament-loops are fastened as in Fig. 27.

but instead of going back into the peritoneal cavity, as did Simpson, he carried the point of the pedicle-needle through the musculo-aponeurotic wall so that it appeared upon the external surface of the aponeurosis. A small cut in the dense

aponeurosis facilitates this step (Fig. 25). The pedicle-needle is then freed from the ligature and withdrawn.

3. By means of the ligature the round ligament is drawn along the track (Fig. 26) and out to the aponeurotic opening, where it is fastened with chromic catgut (Fig. 27).

4. The other side is then treated in the same way, and the abdominal incision is closed as usual.

If preferred, the temporary ligature about the round ligament may be carried through the wall by a forceps introduced from the outside, instead of by the pedicle-needle introduced from the inside. This forceps-technique was developed by C. H. Mayo and was much used in the Mayo clinic. The forceps may be made to grasp the ligature about the ligament (Fig. 28) and bring that out, or it may grasp the ligament itself through the peritoneal opening (Fig. 29), or it may grasp the ligament direct without any peritoneal opening.

In all these methods the opening in the aponeurotic wall through which the ligament is brought out is comparatively small, and in that particular they differ very much from the technique of G. H. Noble, who made a large opening in the aponeurosis and through this opening introduced a finger to locate the ligament subperitoneally and to bring it out, with or without the aid of forceps.

IV. Subperitoneal Transplantation of Round Ligaments, with Lateral Pull.

(BARRETT TECHNIQUE.)

1. After the completion of the other abdominal work, a temporary ligature is placed about each round ligament about 2½ inches (6 cm.) from the uterus.

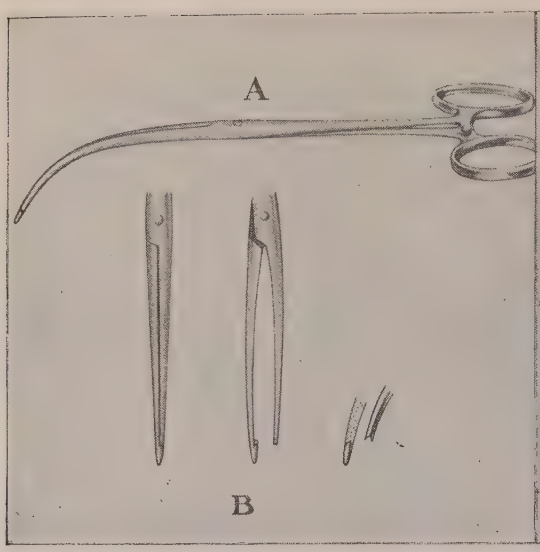
2. A special curved ligature forceps (Fig. 30) is then entered in the abdominal wall at the median incision just beneath the aponeurosis, passed out in the wall to the internal inguinal ring (Fig. 31), then through the ring and along the round ligament subperitoneally to the temporary ligature, where the point of the forceps is thrust through the peritoneum.

More recently Dr. Barrett has made a practice of perforating the peritoneum where the broad ligament joins the abdominal wall instead of at the location of the temporary ligature, and states that he much prefers this.

3. The ligature is grasped with the forceps and drawn out. By means of the ligature, the round ligament of that side is drawn along the forceps-track and out beneath the aponeurosis. The ligament on the other side is then drawn out in the same way, giving the condition indicated in Fig. 32.

4. The ligament-loops are then sutured securely to the under surface of the aponeurosis, and the abdominal incision is closed in the usual way.

By this method the round ligaments may be very conveniently and quickly transplanted into the abdominal wall, with a satisfactory result in most cases.



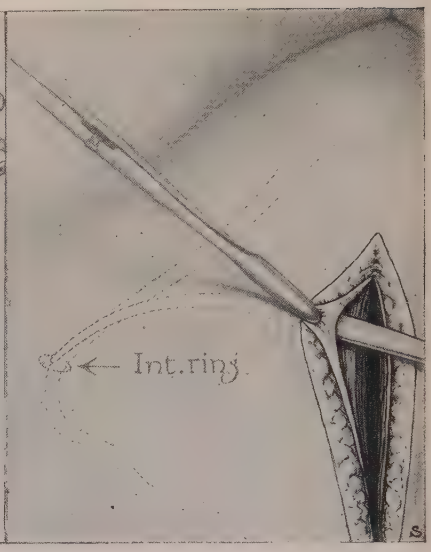


Fig. 30. Fig. 31.

Fig. 30. Subperitoneal Transplantation of Round Ligaments, with Lateral Pull (Barrett technique). A. Ligature forceps (Barrett). B. Showing details of the point of the forceps.

Fig. 31. The ligature forceps carried out in the abdominal wall, and entering the internal inguinal ring. From there it is passed between the layers of the broad ligament or directly into the cavity, as preferred, to grasp the ligature.

However, as the ligaments pass out of the abdomen at the internal inguinal rings, this method presents one of the drawbacks of the Alexander operation—i. e., the pull is lateral instead of forward. This feature may be clearly seen in Fig. 32, which is reproduced directly from Dr. Barrett's article describing the operation.

Fig. 32. The round ligaments transplanted into the wall, showing the exit at the internal inguinal ring on each side. This illustration is from Dr. Barrett's article.

V. Posterior Implantation of Round Ligaments.

(WEBSTER-BALDY TECHNIQUE.)

1. On one side, the Fallopian tube and utero-ovarian ligament are picked up; and through the thin portion of the broad ligament, compressed between the thumb and finger, a curved pressure-forceps is thrust, from behind forward. The forceps enters just under the utero-ovarian ligament and comes out between the Fallopian tube and the round ligament.

2. The round ligament is then grasped (Fig. 33) and drawn through the broad ligament (Fig. 34). The round ligament of the other side is then drawn back of the uterus in the same way. The ligaments are grasped one to two inches from the uterus, as necessary to take up the slack in that particular case.

3. The ligaments are then fastened posteriorly by suturing them to each other and to the posterior uterine wall, as indicated in Fig. 35.

Care should be taken not to suture the ligaments in a twisted position. Also,

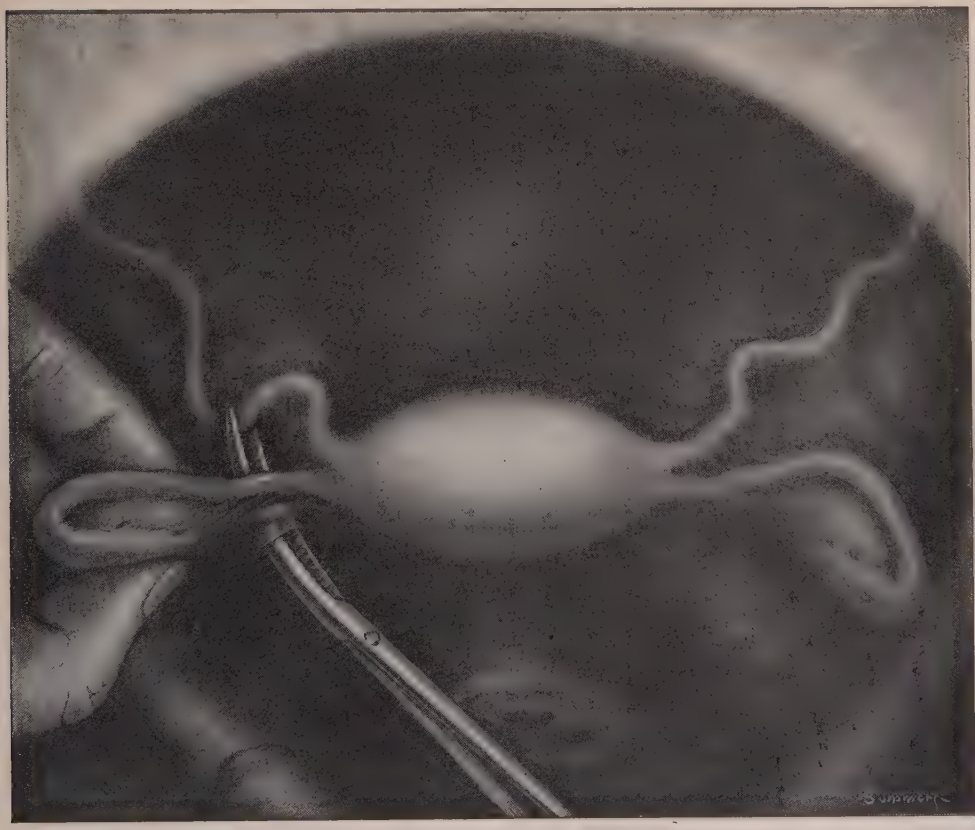


Fig. 33. Posterior Implantation of Round Ligaments (Webster-Baldy technique). Grasping the left round ligament with a forceps, introduced through the broad ligament from behind forward just below the utero-ovarian ligament.

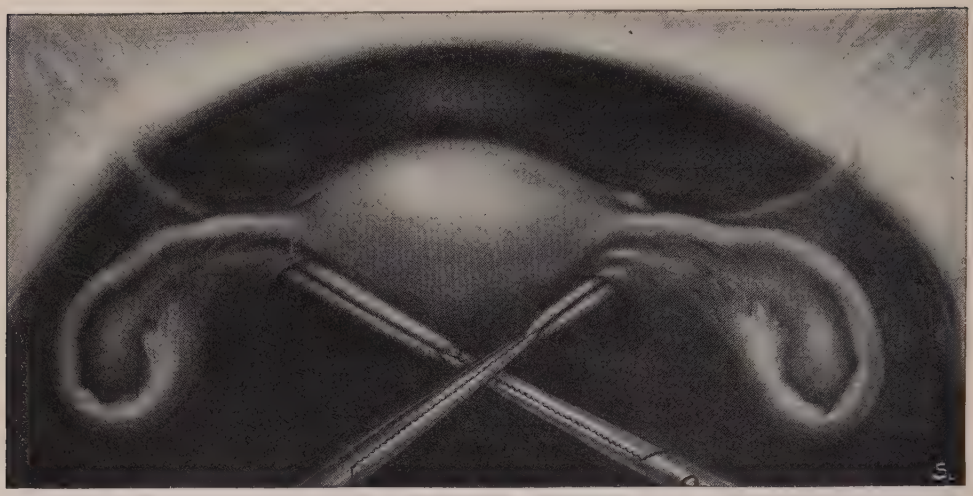


Fig. 34. Both round ligaments grasped and brought backward through the broad ligaments. The left round ligament is in place for implantation. The right ligament is only partly drawn through the broad ligament.

all raw surfaces should be turned in to prevent adhesions. In this connection it is well to place one suture at the point where the round ligament-loop leaves the posterior surface of the broad ligament, on each side.

A modification of this posterior implantation is exceedingly useful in cases where the adnexa of one or both sides have been removed. The round ligament is simply folded back over the adnexal pedicle (Fig. 36) and sutured along the posterior-lateral area of the uterus (Fig. 37). This is useful in two ways—it

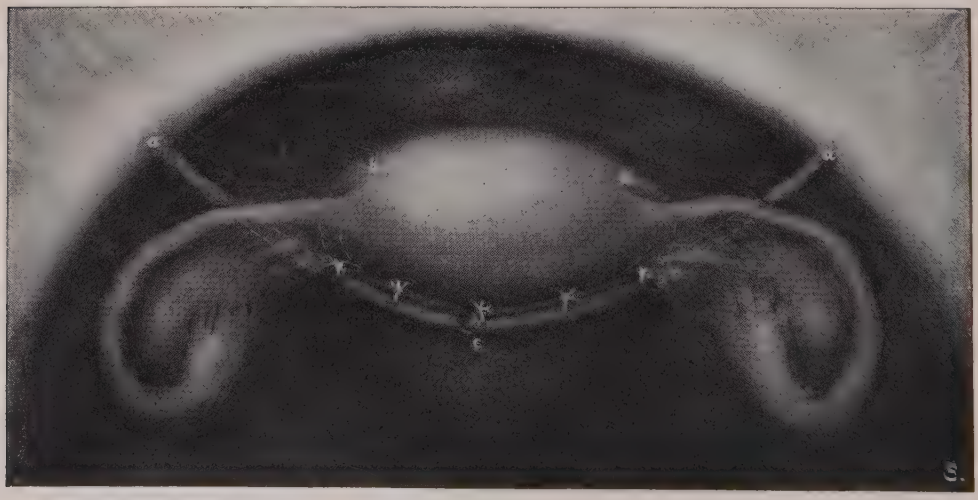


Fig. 35. Both ligaments in place and sutured. Notice that the point of attachment of the active portion of the ligament is shifted to the back of the uterus, changing the direction of pull from *b*—*a* (lateral) to *c*—*a* (forward).

effectually covers the raw pedicle-ends and at the same time holds the uterus forward and upward by shortening the round ligament and shifting its attachment to the back of the uterus.

Fig. 36. Fig. 37.

Fig. 36. Posterior implantation of round ligaments where adnexa have been removed. Passing the first suture. The point on the round ligament caught in the suture is to be fastened to the selected point on the posterior surface of the uterus, indicated by the needle.

Fig. 37. The first suture tied. The proximal portion of the round ligament is then sutured to the uterus as here indicated. The suturing is continued all the way to the uterine end of the ligament, thus completely covering the raw surface of the adnexal pedicles.

VI. Lateral Folding of Round Ligaments.

(MANN TECHNIQUE.)
(DUDLEY TECHNIQUE.)
(LONG TECHNIQUE.)

By the Mann technique each round ligament is folded upon itself so that there are three thicknesses. The folds are then sutured to each other and to the parietal peritoneum and to the uterus at the other end, if the end reaches to the uterus.

1. On one side the round ligament is grasped with a forceps one-third of its length from the uterus, and with another forceps one-third of its length from the abdominal wall (Fig. 38).

2. The first point is carried to the distal end of the ligament at the abdominal wall and sutured there. The second point is brought to the proximal end of the ligament at the uterus and sutured there. Also, the approximated portions of ligament are sutured together, giving the result indicated by dotted outlines in Fig. 38.

3. The other round ligament is treated in the same way, thus completing the operation.

When a round ligament is not sufficiently relaxed to permit of its being shortened to one-third its former length, the loop, as long as necessary, should

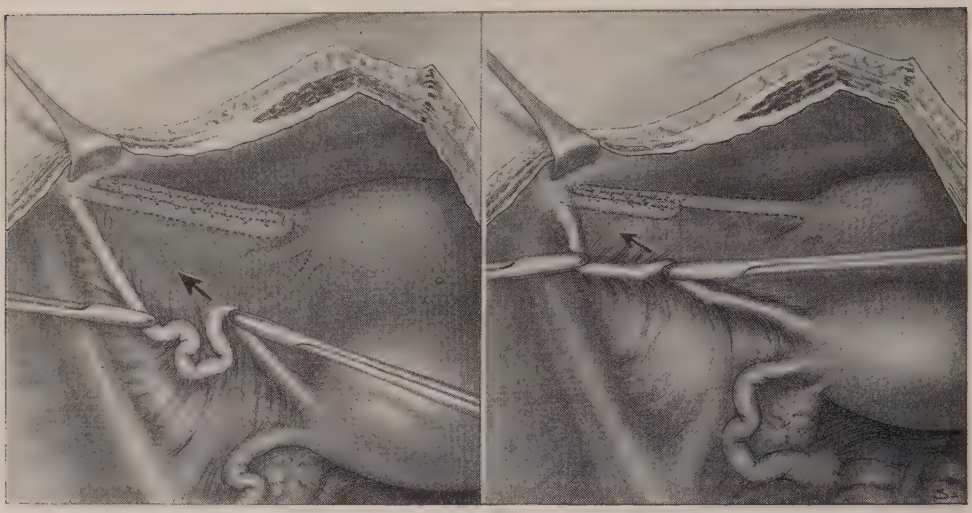


Fig. 38. Fig. 39.

Fig. 38. Lateral Folding of the Round Ligaments (Mann technique). The forceps on the proximal portion of the ligament is carried to the distal end of the ligament at the abdominal wall, while the forceps on the distal portion of the ligament is carried to the uterus. The folds are then sutured in that position, giving the result shown above in dotted outline.

Fig. 39. When only a portion of the ligament needs to be folded, it is well to make the fold at the outer end as here indicated, so as to strengthen the outer weaker portion of the ligament. Chromic catgut or fine silk should be used for the suturing, and the sutures should not include the whole thickness of the ligament.

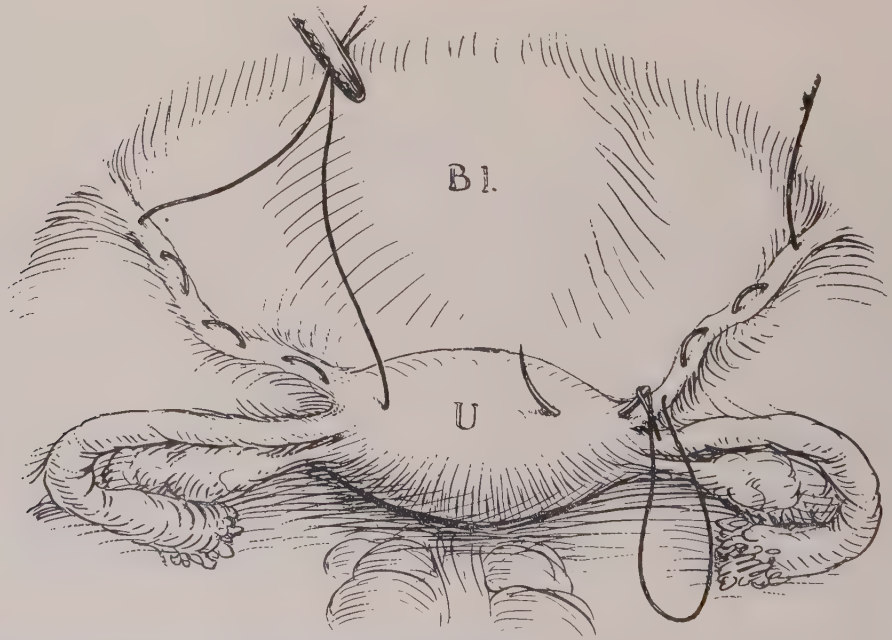


Fig. 40. Folding of the Round Ligament (Dudley technique). The sutures may be of linen or silk or chromic catgut.

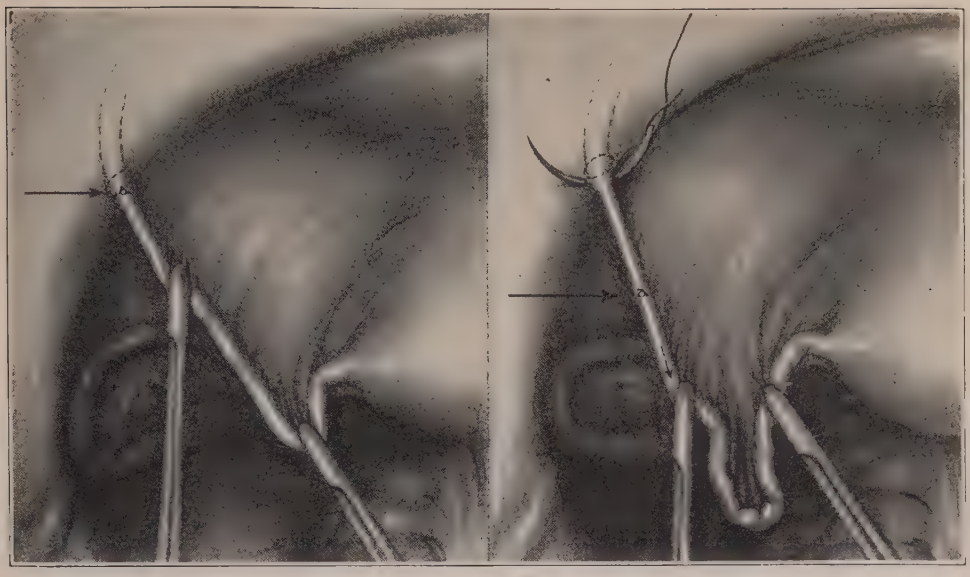


Fig. 41. Fig. 42.

Fig. 41. Folding of the Round Ligaments (Long technique). The first step is to draw the ligament well out of the canal by traction with a forceps—the portion of the ligament at "a" in this illustration being drawn to "a" in the next illustration.

Fig. 42. The needle is passed through the ligament right at the canal entrance, thus securing practically a fixed point for the folding suture.

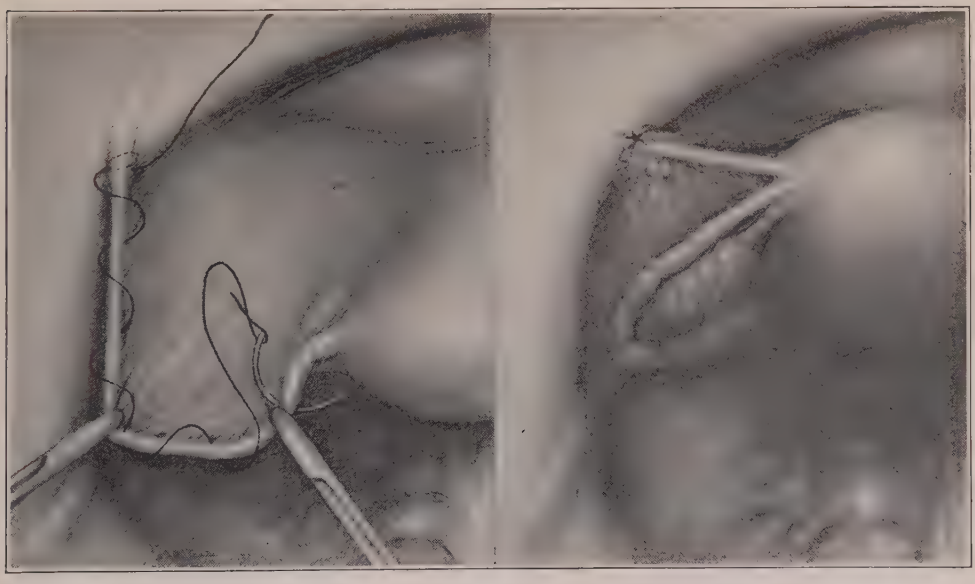


Fig. 43. Fig. 44.

Fig. 43. Fine strong linen or silk is used for the sutures. The needle is passed *through* the ligament, not under it, so that the blood supply is not interfered with.

Fig. 44. After the suture is tied, if there is still laxity of the ligament one or more extra portions are caught up and tied.

be made at the outer end of the ligament, as indicated in Fig. 39. This strengthens the outer weak portion of the ligament.

Dudley passed a suture in and out along the top of the round ligament as indicated in Fig. 40. When this suture was tied the included portions of the ligament were crumpled up and the ligaments were thus shortened.

Long (Annals of Surgery, June, 1916) developed a very satisfactory method of "shirring" the round ligaments. It is simple and can be carried out quickly—a point of importance in a measure that is only a step in a series of operative procedures.

1. The round ligament of one side is grasped (Fig. 41) and pulled out of the inguinal canal as far as practicable (Fig. 42).

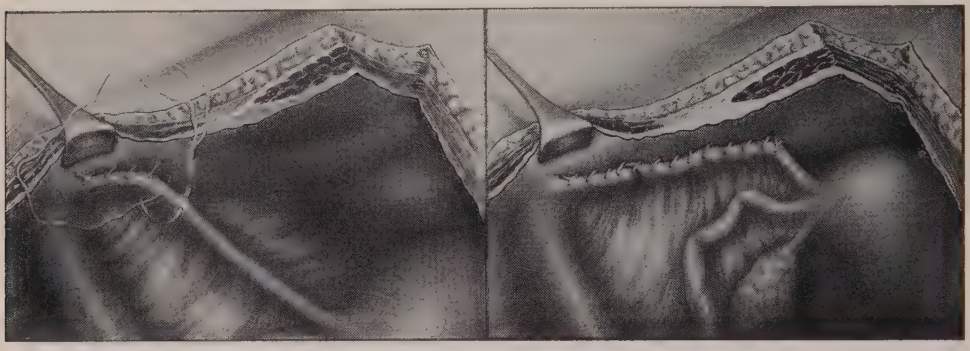


Fig. 45. Fig. 46.

Fig. 45. Ventral Suturing of the Round Ligaments (Neuhof technique). The suture should include about half the thickness of the round ligament and should take deep bites of the abdominal wall. It is well to roughen the surface of the ligament before approximation.

Fig. 46. The suturing completed. The fastening may be made more secure by adding on each side a single silk suture, at the point where the ligament leaves the wall to pass to the uterus.

2. While the ligament is held taut, a needle carrying a fine strong linen or silk suture is passed through the ligament at its exit from the canal (Fig. 42) and then through and through the ligament along its course to near the uterus, as shown in Fig. 43.

3. The suture is then tied, shortening the ligament as indicated in Fig. 44, and the other round ligament is then likewise shortened.

VII. Ventral Suturing of Round Ligaments.

(NEUHOF TECHNIQUE.)

The round ligament of each side is sutured securely to the anterior abdominal wall, from the distal extremity of the ligament to within a short distance of the uterus, as indicated in Figs. 45 and 46. The suturing is begun at the internal ring and continued inward, toward the median line, fastening the ligament securely to the abdominal wall. The suture loops should be fairly close together

to secure complete approximation of ligament to abdominal wall. The needle should take in only about half the circumference of the ligament, so as not to interfere with its nutrition, but should take a good bite of the parietal peritoneum and the underlying fascia.

If a ligament is very long, it may be advisable to fold it some during the suturing. It is well to roughen the portion of ligament to be approximated to the wall. At the point where the sutured ligament leaves the wall it is well to reënforce the chromic catgut suture by a single suture of fine silk or linen. If preferred fine silk or linen may be used throughout for the suturing. This gives more secure fastening and is perhaps preferable in clean cases. If infection be present in the pelvis, however, the silk suture, resisting absorption indefinitely, may lead to persistent trouble.

VIII. Ventro-Fixation of Fundus Uteri.

(OLSHAUSEN TECHNIQUE.)
(KELLY TECHNIQUE.)
(LEOPOLD TECHNIQUE.)

The fundus uteri is fastened securely to the anterior abdominal wall about 2 inches (5 cm.) above the pubic bone. The fixation sutures pass deeply into the fascial and muscular layer of the abdominal wall. It is not necessary to have them come out through the skin for removal as in former times. Buried sutures of chromic catgut or of silk may be used. The fixation sutures may take hold of the round ligaments as they join the uterus, after the method of Olshausen, or they may take hold of the utero-ovarian ligaments as they join the uterus, as suggested by Kelly, or they may take hold directly of the tissues of the fundus uteri,

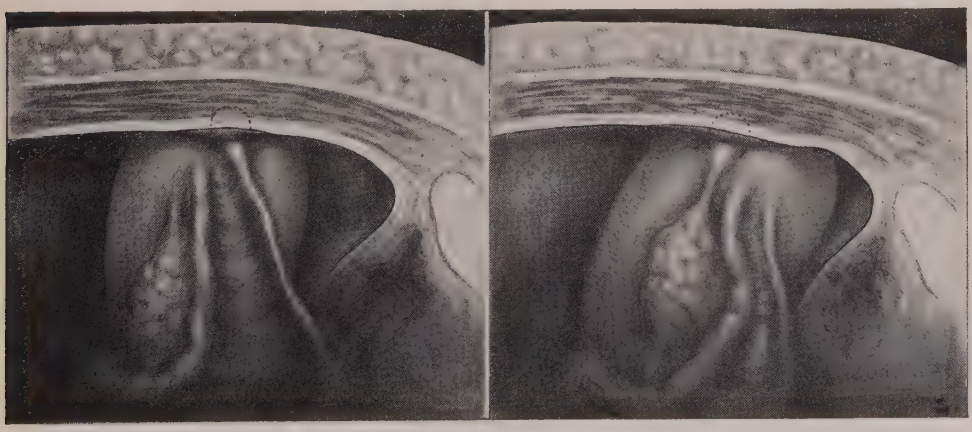


Fig. 47. Fig. 48.

Fig. 47. Ventro-Fixation of Fundus Uteri (Olshausen technique). The fixation sutures are passed through the round ligaments, at their junction with the uterus.

Fig. 48. Ventro-Fixation (Kelly technique). The fixation sutures are passed through the utero-ovarian ligaments, giving a better forward inclination of the uterus.

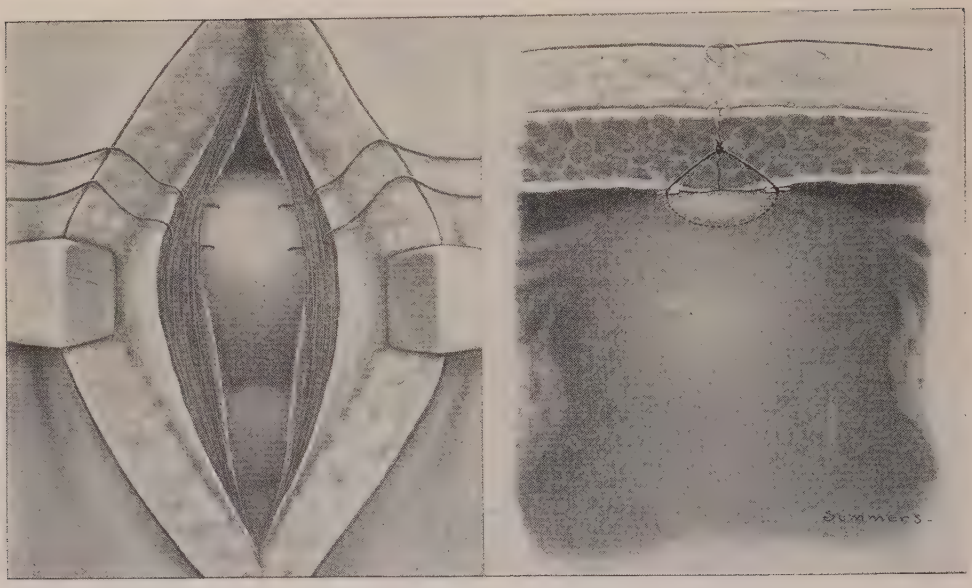


Fig. 49. Fig. 50.

Fig. 49. Ventro-Fixation (Leopold technique). The fixation sutures are passed directly through the fundus uteri. They should be passed through the posterior surface of the fundus.

Fig. 50. It is well to scarify the uterine surface freely and also to draw aside the peritoneum as indicated here, so that the uterus is fastened directly to the fascial layers of the abdominal wall.

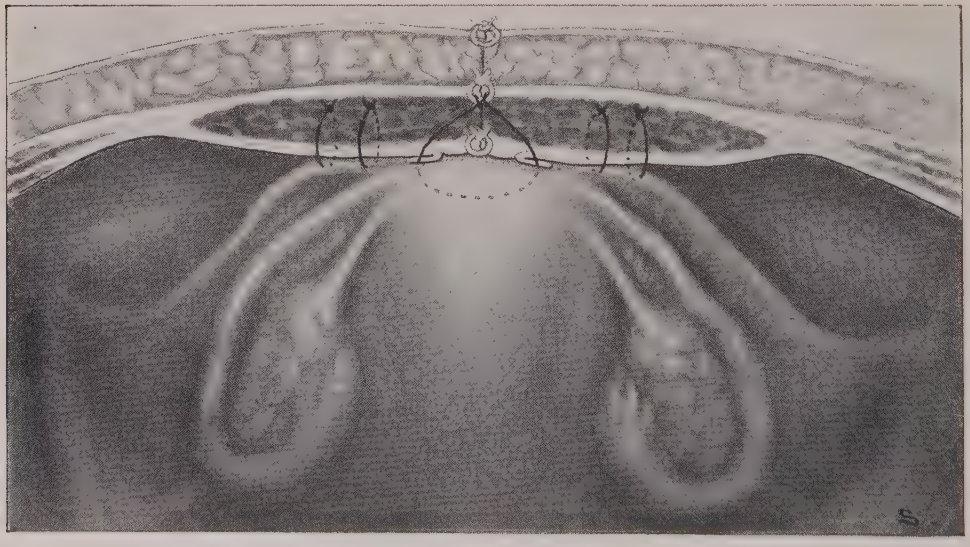


Fig. 51. Ventro-Fixation (Vineberg technique). The fixation sutures are passed through the fundus uteri and also through the round ligaments.

as practiced by Leopold. The first mentioned method is shown in Fig. 47, the second in Fig. 48, and the third in Fig. 49. In all of these methods, in order to secure certain and firm fixation, it is necessary to scarify the uterine surface freely, and when the fixation sutures are passed through the central portion of the fundus uteri it is advisable to push aside the parietal peritoneum so as to bring the scarified uterus in direct contact with the fibrous tissues of the abdominal wall, as indicated in Fig. 50. The line of sutures should be on the posterior surface of the fundus, to give good forward inclination and secure fastening. If preferred, a combination of the Olshausen and the Leopold methods may be used, as suggested by Vineberg (Fig. 51).

Ventro-fixation, as here described, is, of course, to be used only in patients presenting no possibility of future pregnancy. Some operators are employing ventro-fixation in childbearing women, fastening the anterior surface of the fundus uteri to the abdominal wall because fixation of the anterior surface does not give as much trouble in subsequent pregnancy as fixation of the posterior surface. But real fixation by either surface is dangerous should pregnancy ensue and it seems to the author decidedly inadvisable to employ any form of ventro-fixation in the childbearing woman when there are so many other safer and satisfactory methods.

Graves suspends the uterus by the round ligaments by the modification of the Olshausen operation described in the table (page 43). By means of the heavy silk ligature, the round ligament of each side, caught some distance from the uterus, is made to fuse with the abdominal wall.

IX. Ventro-Suspension of Fundus Uteri.

(KELLY TECHNIQUE.)

The posterior surface of the fundus uteri is sutured, by two or three silk sutures, to the peritoneum of the abdominal wall, as indicated in Figs. 52 to 55.

Ventro-suspension gave excellent results in a large proportion of the cases, but there was a certain small proportion in which the results were not satisfactory. These unsatisfactory cases were principally of two kinds. First, there were cases in which the suspension bands stretched, allowing return of the retrodisplacement. Second, there were cases in which the intended suspension became really a fixation, the fundus uteri becoming fastened securely to the abdominal wall and thus causing serious trouble during pregnancy, even to the extent of necessitating Cæsarean section in some cases. In the course of time, methods which were more certain in lasting results and less dangerous in pregnancy were developed and are now used in the childbearing period.

Ventro-suspension is described here partly because of its historical importance (it was an important step in the development of effective treatment for retrodisplacement) and partly because some surgeons to this day do not seem to have a clear idea of the difference between ventro-suspension and ventro-fixation, in fact some use the terms interchangeably.

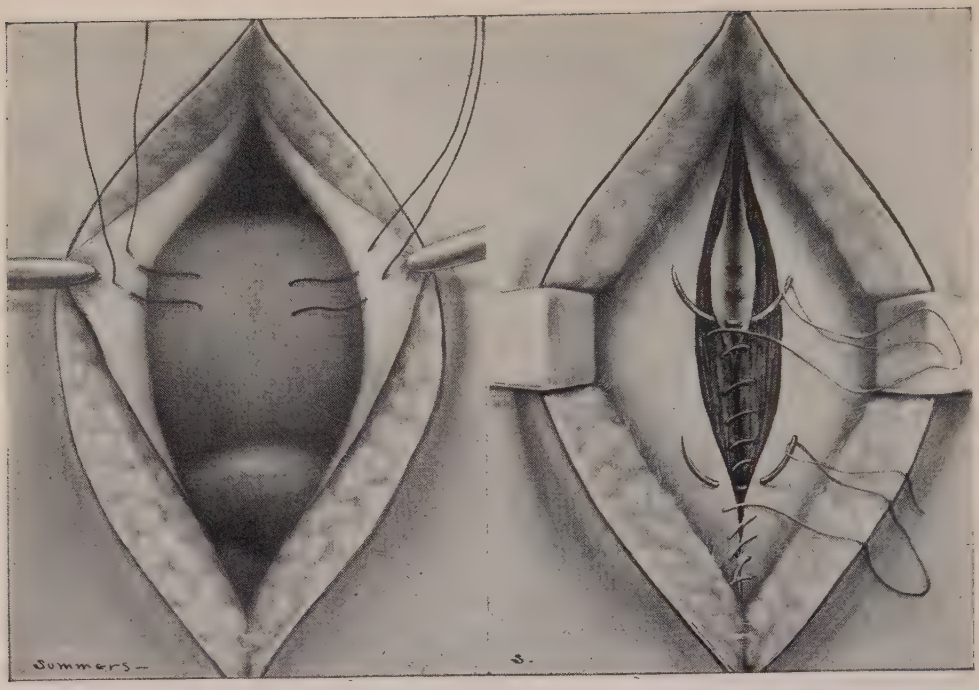


Fig. 52. Fig. 53.

Fig. 52. Ventro-Suspension of Fundus Uteri (Kelly technique). The suspending sutures are of silk or linen, and are passed through the posterior surface of the fundus.

Fig. 53. The suspending sutures include only the peritoneum of the abdominal wall. The abdominal wound is closed in the usual way, as here indicated.

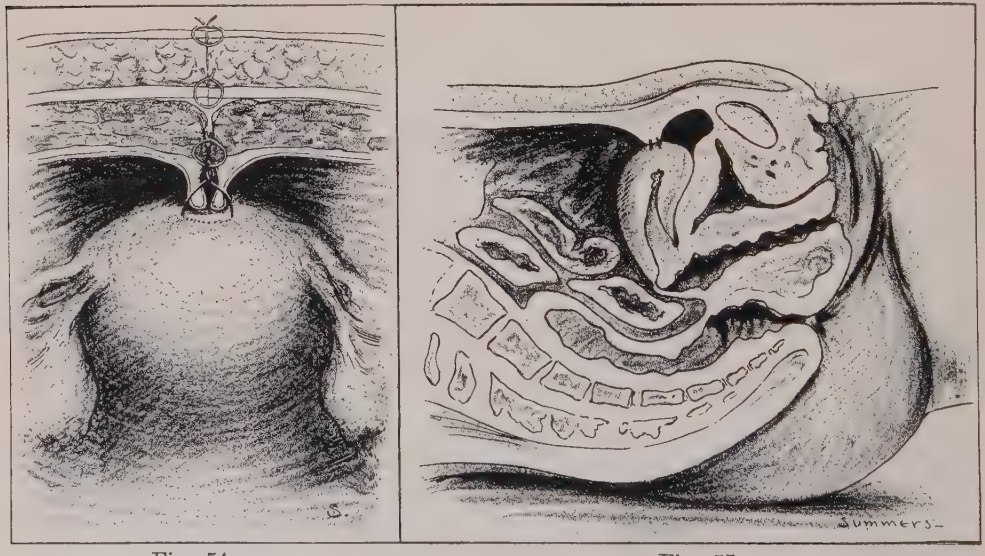


Fig. 54. Fig. 55.

Fig. 54. Transverse sectional view, showing the parietal peritoneum sutured to fundus uteri.

Fig. 55. Longitudinal sectional view, showing the location of the suspending sutures on the posterior surface of the fundus.

Various other methods of ventro-fixation and ventro-suspension are given in the table (pages 38 and 39).

X. Anterior Plication of Broad Ligaments.

(COFFEY TECHNIQUE.)

1. A suture of chromic catgut is passed through the round ligament about an inch and a half (4 cm.) from the uterus and this point is stitched to the anterior surface of the uterus just above the vesico-uterine peritoneal fold, and interrupted sutures are continued up to the uterine end of the ligament (Fig. 56). The same step is then carried out on the other side. The suture material should be chromic catgut. Dr. Coffey prefers interrupted sutures, attributing two recurrences in the first twenty cases to the use of a continuous suture of plain catgut in that series. However, the failure to hold was probably due to rapid absorption of the plain catgut rather than to imperfect approximation by the continuous suture.

2. A point is then selected about one and one-half inches (4 cm.) farther along on the ligament and this is stitched to the fundus uteri as indicated in Figs. 56 and 57. The resulting fold is sutured down the anterior surface of the uterus (Fig. 57) and the same step is carried out on the other side.

3. A fold of broad ligament on each side is then brought over the last fold of round ligament and sutured to the anterior surface of the uterus, as indicated in Fig. 58, and the operation is complete.

Plication of the round and broad ligaments in front of the uterus, as shown in Figs. 56 to 58, may give good results in some cases, but the theory of peritoneal support advanced by the originator is, in the opinion of the author, entirely erroneous. Hertzler, who was a pupil of Waldeyer and who has studied the peritoneum for years and written one of the best books upon it, states that "the peritoneum acts as a suspensory ligament nowhere under any condition." The suspending tissue lies between the layers of the peritoneum. The actual thinness of the peritoneum can be appreciated by picking up a mesentery on the finger and noticing the delicacy of the double thickness thus presented. The success of this and similar operations is due to the subperitoneal structures (the round ligaments and the fibrous and muscular tissues of the broad ligaments) gathered in and fastened, and not to the delicate peritoneum, which is intended for covering rather than support. The embryological observation that suspending ligaments are situated where two peritoneal surfaces blend in process of development, does not sustain the assertion that the fully developed suspensory ligaments contain peritoneum only.

A simpler method of plication, presented by Willis, is to make one fold on each side. The fold should be large enough to take up the slack and it is fastened to the anterior surface of the fundus by a single suture which includes the two ligaments and brings them together as shown in Fig. 59. Additional sutures are used

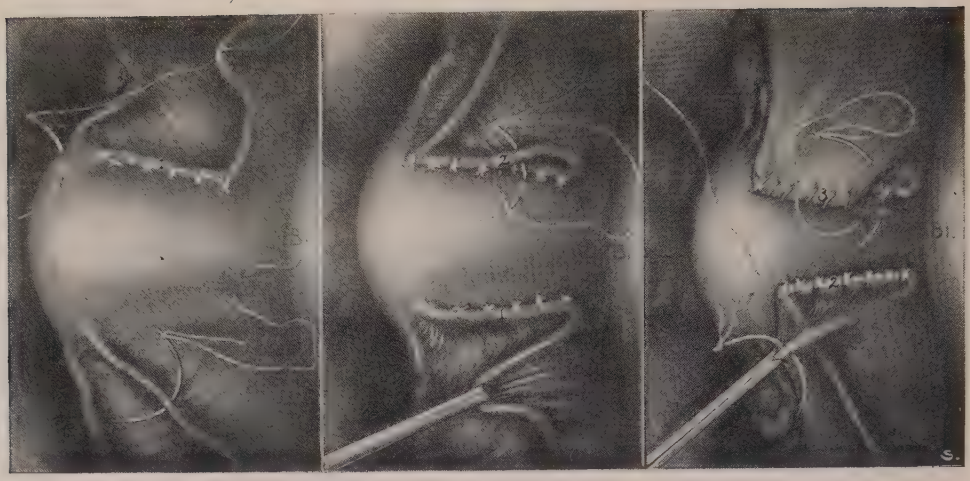


Fig. 56. Fig. 57. Fig. 58.

Fig. 56. Anterior Plication of Broad Ligaments (Coffey technique). On the right side of the uterus the first suture is being passed. On the left side of the uterus the first row of sutures is completed and the second row is begun.

Fig. 57. Second row of sutures almost completed on the left side. First row completed on the right side, and ligament grasped to begin second row. The sutures are of chromic catgut.

Fig. 58. The running suture for bringing over the third fold, almost completed on the left side. The same suture just begun on the right side. This last suture on each side takes up the slack in the broad ligament.

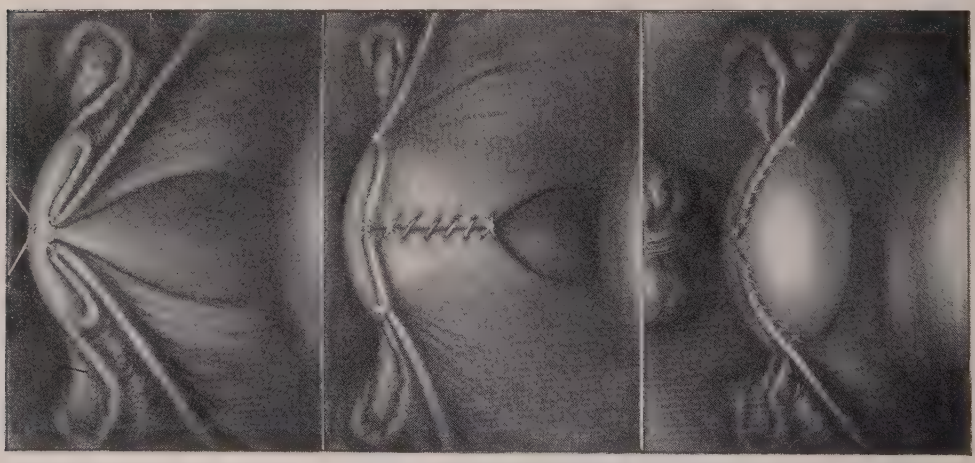


Fig 59. Fig. 60. Fig. 61.

Fig. 59. Willis technique. Plication by one fold only on each side. A single suture brings the folds together on the front of the fundus uteri.

Fig. 60. Willis technique. Each round ligament is fastened, also, by a suture placed laterally, as here indicated, and the broad ligaments are sutured together in front.

Fig. 61. Kime technique. A loop of each round ligament is fastened on the posterior surface of the fundus uteri, and then sutured over the top, as shown in the illustration. In fastening the ligament over the top of the uterus care should be taken to keep it median to the tube origin, so that there will be no interference with the tube.

as desired to fasten the slack loop securely. Also, the broad ligaments are sutured together across the front of the uterus for some distance, as indicated in Fig. 60.

Another method, presented by Kime, is to fasten the ligament fold of each side to the posterior surface of the fundus uteri and over the top as indicated in Fig. 61. This method is more likely to give satisfactory results than either of the other two.

XI. Abdominal Shortening of the Utero-Sacral Ligaments.

(BOVÉE TECHNIQUE.)
(NOBLE TECHNIQUE.)
(YOUNG TECHNIQUE.)

Work on the intro-sacral ligaments is rather difficult on account of the deep situation in the pelvis and the great attenuation often present. For satisfactory execution of operative work here, marked Trendelenburg posture is necessary and the pelvis must be cleared of intestinal coils. The pioneer

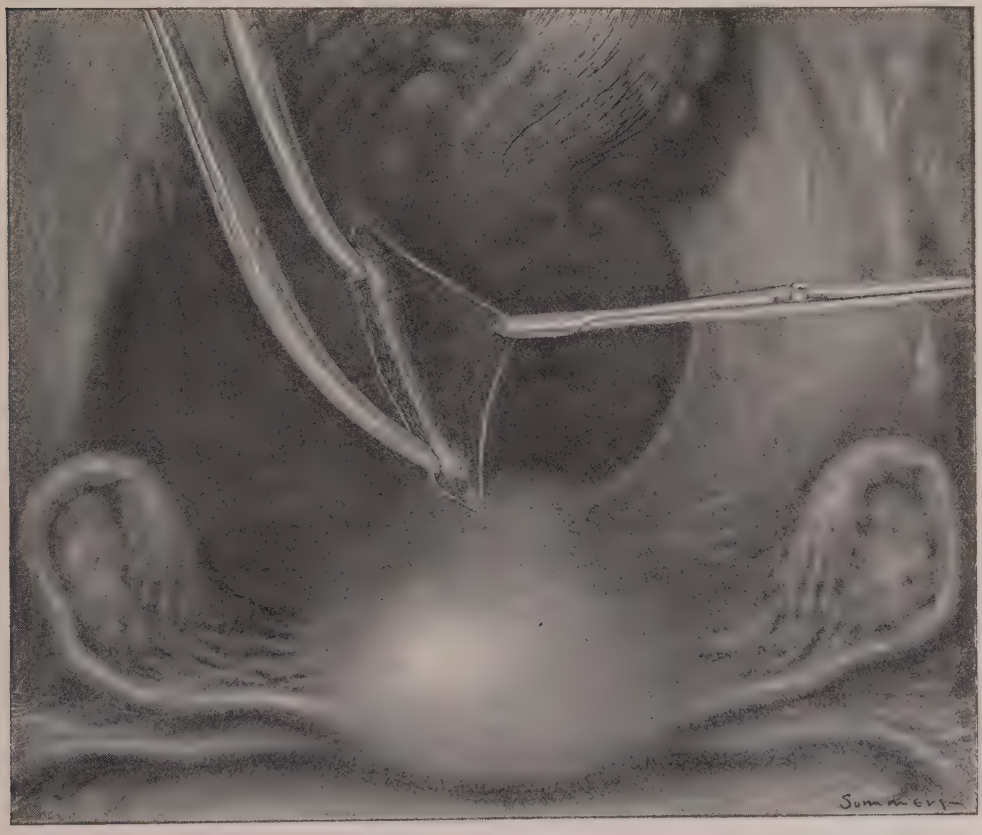


Fig. 62. Abdominal Shortening of Utero-sacral Ligaments (Bovée technique). Isolation of the right utero-sacral ligament through an incision in the peritoneum over it. The upper edge of the ligament is identified and isolated by the finger.

technique of Bovée (Figs. 62 to 66) is of historical importance, but in practice it has been found too elaborate and time-consuming. The simple method of Noble (Figs. 67, 68) gives peritoneal union only and hence is not sufficiently strong or lasting. The technique of shortening the utero-sacral ligaments must meet two demands. First, it should provide a subperitoneal union of tissue, as the simple peritoneal union is too easily stretched. Second, the operation should be of comparatively short duration. In most cases it is only a step in a series of operative procedures by which it is hoped to restore the pelvic organs to proper condition. Shortening of the round ligaments, to assist in holding the corpus uteri forward, is always required and it is often necessary also to remove an ovary or tube and to remove the appendix and to repair the pelvic floor. While the time required for each of these operations is short, taken all together the time insidiously mounts—some-

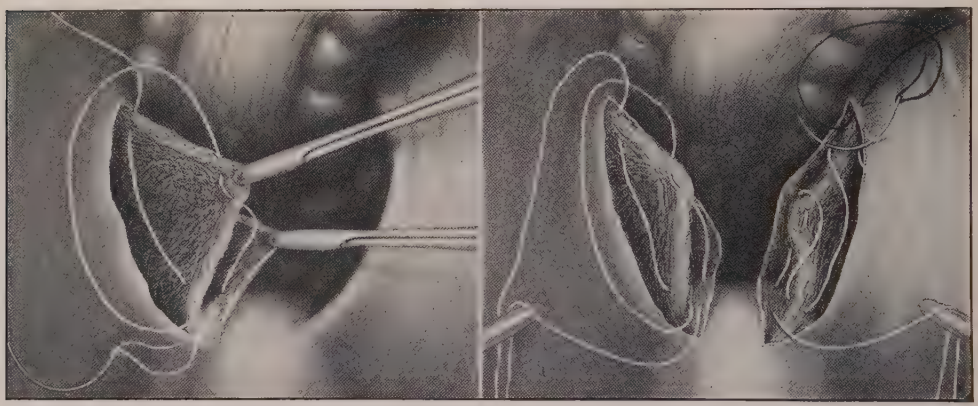


Fig. 63. Fig. 64.

Fig. 63. Ligament drawn out and the shortening-suture in place. The suture is passed through the sacral end of the ligament, then through the uterine end, then through the center of the fold (held in forceps) and then through the cervix below the attachment of the ligament. The suture is left lax.

Fig. 64. Both shortening-sutures passed and left lax. The peritoneal suture begun. Either set of sutures may be of chromic catgut or fine silk, as preferred. All sutures are passed before any one of them is drawn tight.

times going beyond the hour and carrying an increasing strain and menace to any vital function that may be below par.

In cases requiring shortening of the utero-sacral tissues, the utero-sacral ligaments have been so stretched and attenuated that they are practically obliterated. The overstretched culdesac area presents lax smooth surfaces, as shown in Fig. 69, without a visible trace of utero-sacral ligaments. The task is really to construct new ligaments from the lax tissues of the area. For this purpose, Young (Surgery, Gynecology and Obstetrics, September, 1919) devised an effective technique which, with minor modifications, permits of fairly rapid execution. The steps are as follows:

1. With the patient in marked Trendelenburg posture and the intestines scooped out of the pelvis and the corpus uteri drawn forward, giving good exposure of the culdesac, the peritoneum over the lower portion of the uterus is grasped on the left side as indicated in Fig. 70. By traction on this forceps, the peritoneum and underlying tissues of the left side are made to stand out (Fig. 70) and are grasped further along by forceps No. 2 (Fig. 71). Traction on forceps No. 2 brings out the posterior tissues, which are then grasped by forceps No. 3 (Figs. 71, 72).

2. An incision is then made in the peritoneum over the lower extremity of the uterus as shown in Fig. 72. A good bite into this subperitoneal tissue is then taken with a suture, which is later carried through the tissue grasped in forceps No. 3, about an inch (2½ cm.) from the rectum, as indicated in

Fig. 65. Fig. 66.

Fig. 65. All sutures passed. The ligament sutures are tied first, and then the peritoneal sutures.

Fig. 66. The operation completed. The cervix uteri is drawn back near the sacrum and all raw surfaces are covered. This gives the corpus uteri a much better forward inclination—by whatever method the latter is subsequently fastened anteriorly.

Fig. 73. This suture, left long and with needle attached, is held aside with a forceps while a similar suture is passed on the right side (Fig. 74).

3. The suture on the right side is passed and this is tied at once, bringing the short band of peritoneum and underlying tissue into the subperitoneal opening (Fig. 75). The resulting loop of lax tissue is then sutured securely in two or three steps, as indicated in Figs. 75 to 77.

4. The left suture is then tied, forming the left ligament, and the resulting loop of loose tissue is sutured and fastened down by several ties (Figs. 78, 79). The peritoneum at the lower end of the wound is then caught and sutured forward to cover all raw areas, as indicated in Figs. 79 and 80.

In executing the operation care should be taken to place the attachment

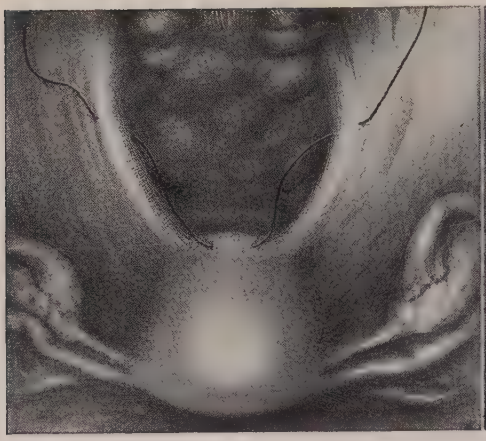


Fig. 67.

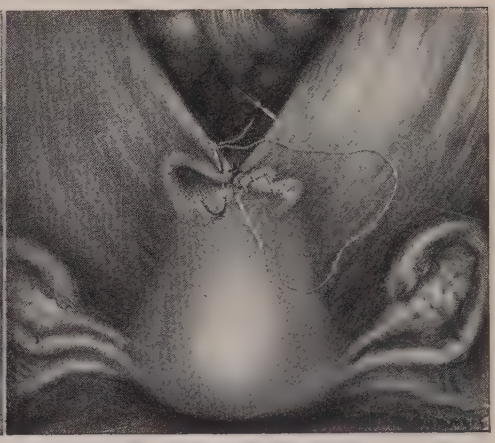


Fig. 68.

Fig. 67. Noble technique. The shortening suture is passed without incision of the peritoneum. A single suture includes the two utero-sacral ligaments and the posterior surface of the cervix uteri. The surfaces to be approximated are scarified.

Fig. 68. The shortening-suture tied. This suture should be of silk or linen. It is well to suture the slack of the ligament securely to the posterior surface of the cervix with catgut, as here indicated. The ligaments should be fastened well down on the posterior surface of the cervix, below the pivotal area of the uterus.

Fig. 69. The posterior area in a case where all the tissues are so overstretched and lax that there are no indications of utero-sacral ligaments.

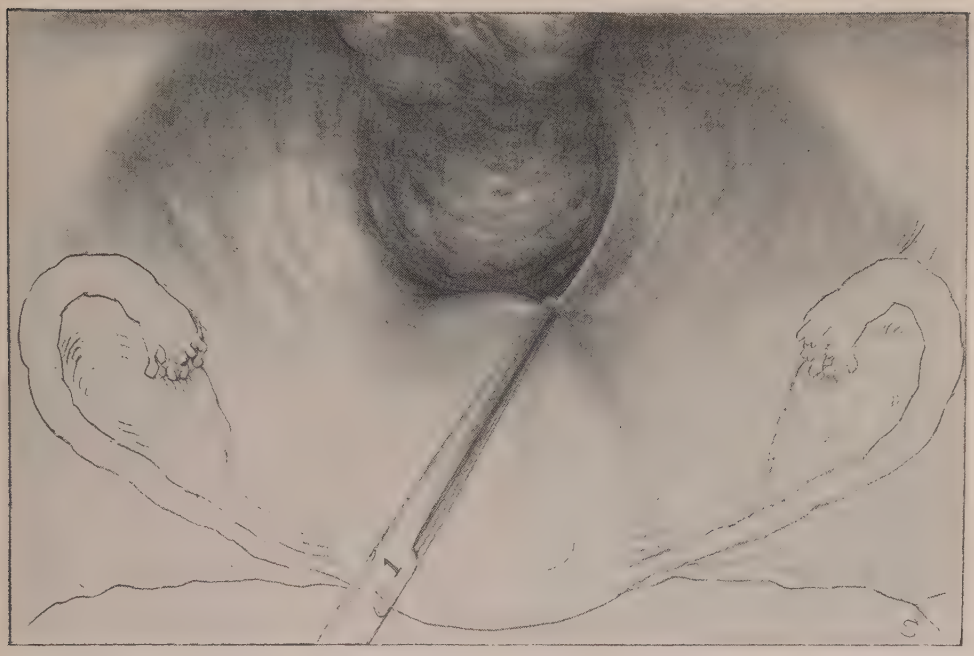


Fig. 70. Shortening of the utero-sacral tissue (Young technique). The first forceps in place and traction being made with it.

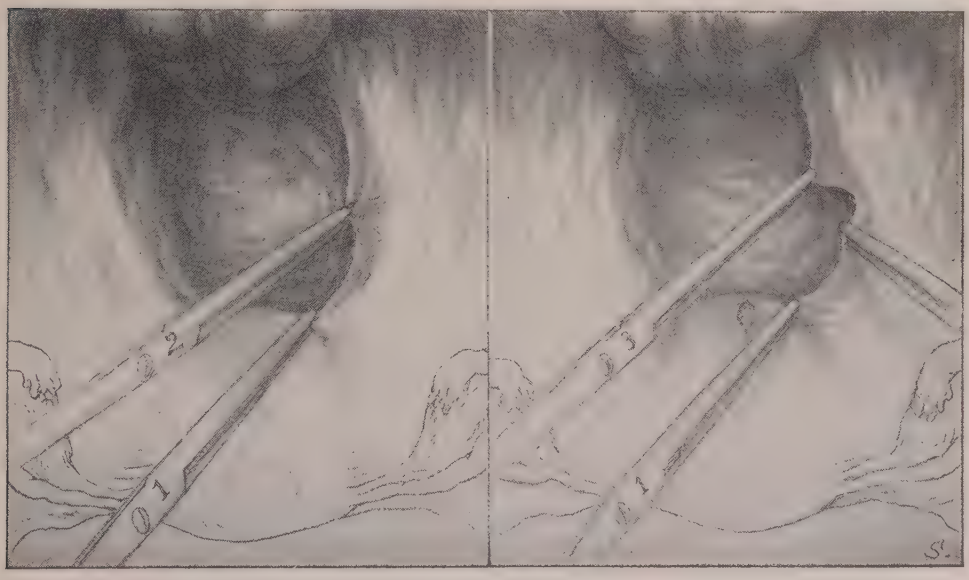


Fig. 71. Fig. 72.

Fig. 71. The second forceps in place, drawing out the lateral tissue of the culdesac area.

Fig. 72. The third forceps in place, drawing out the tissues extending around the rectum and taking hold of the sacrum.

of the new ligaments well down on the cervix, below the main broad ligament support which acts somewhat as a fulcrum. When properly placed, the backward and upward traction of the new ligaments tips the fundus forward. When placed too high the traction acts less advantageously, throwing more strain on the subsequently shortened round ligaments. With everything

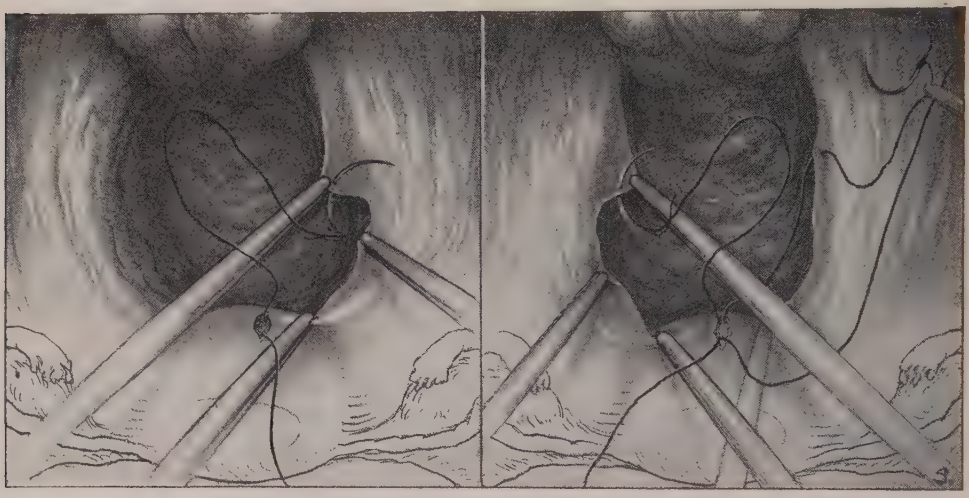


Fig. 73. Fig. 74.

Fig. 73. The incision made on the posterior surface of the cervix uteri and the first suture passed.

Fig. 74. The suture on the opposite side passed.

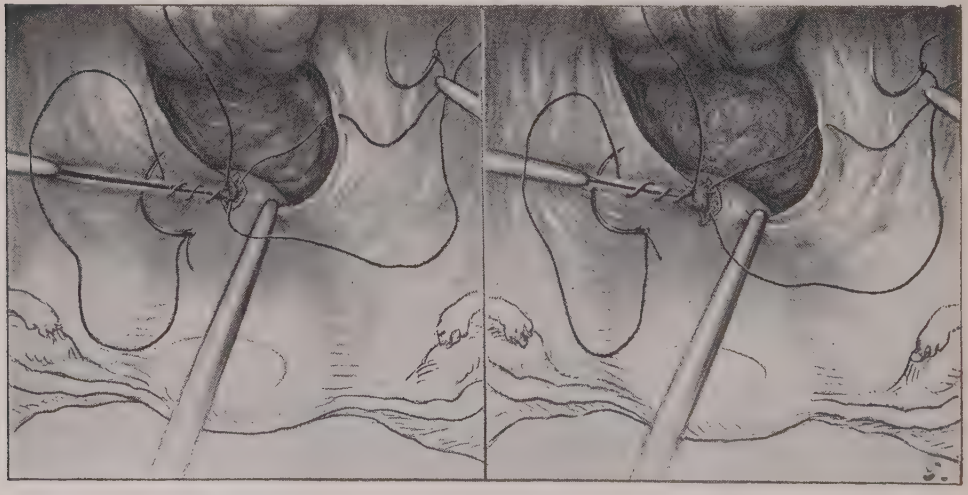


Fig. 75. Fig. 76.

Fig. 75. The suture on the right side tied down, shortening the utero-sacral tissues on that side, and the excess loop partly sutured.

Fig. 76. The excess loop partly obliterated, by the previously sutured portion being tied down, and the last portion of it being sutured.

so overstretched posteriorly it is easy to misjudge the best location for the new ligament-attachment and to place it too high on the uterus, as the author did in one case.

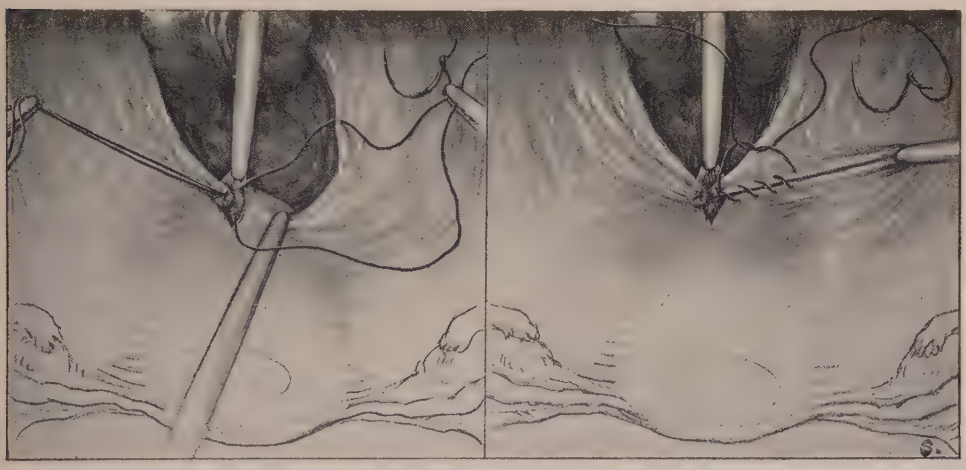


Fig. 77. Fig. 78.

Fig. 77. The right ligament entirely sutured.
Fig. 78. The left utero-sacral tissues shortened, and the excess loop being sutured.

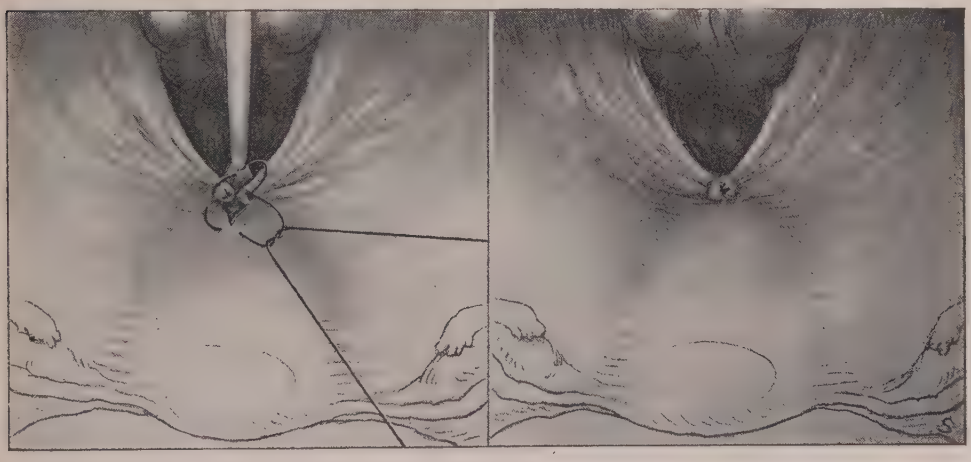


Fig. 79. Fig. 80.

Fig. 79. Shortening of utero-sacral tissues finished on both sides, and the area being covered with peritoneum.
Fig. 80. Operation completed.

Particular care should be taken to close securely all openings in the loop of redundant tissue at each side, so that there is no chance for straining to separate the tissues slightly and force an intestinal coil through this small opening, with consequent acute intestinal obstruction. This point is not

altogether theoretical. The author had one such unfortunate experience while developing the technique of the operation. The overstretched posterior tissues were shortened as one step in the required extensive pelvic work, the loop of redundant tissue on each side being closed as usual with a running suture. The patient made a smooth recovery and went home. About a week later she was seized with sudden severe abdominal pain, which continued and was accompanied with persistent vomiting. A telephone message stated that she was having an attack of indigestion. The assistant who responded to the call found that the history and physical findings indicated acute intestinal obstruction and he at once forwarded the patient to the hospital. Immediate operation showed that a loop of small intestine had been forced through a small opening external to the new ligament on the right side. To release the constricted loop of intestine it was necessary to divide this new ligament, which was not resutured as resuturing under the circumstances was not practicable. The patient recovered promptly and with satisfactory anatomical result, the new ligament on the other side evidently being sufficiently strong to maintain the backward traction on the cervix. Since then the author has been careful in closing the loop of lax tissue on each side (a) to make the closure in steps (by taking a few short turns with the suture and then tying it down as shown in Figs. 75 and 76, and repeating this process until the whole is sutured and tied so that it is apparently secure against any strain) and (b) to test the closure by trying to force a finger-tip through the repaired area from behind.

Another point in the technique of the operation is to leave the culdesac opening large enough so that the intestinal coils may slip back and forth easily. A little traction in the right direction is sufficient to hold the cervix back. The object of the operation is not to narrow the culdesac opening beyond normal, but simply to shorten the lateral tissues sufficiently to lift the cervix into the posterior half of the pelvis. Of course, in the shortening, allowance must be made for some subsequent stretching of the new ligaments. The author leaves the culdesac opening large enough to take two or three fingers easily at the close of the operation.

As to suture material, moderately fine linen or silk is preferable to catgut, on account of the greater security against softening of the suture and separation of the surfaces under strain, which might lead to intestinal obstruction or to recurrence of the prolapse of the cervix.

Young's technique, splendidly illustrated and detailed in the excellent article previously referred to, differs from that given above in the following particulars:

a. As soon as the left ligament is caught with forceps No. 1, a long catgut traction stitch is passed through the tissue and the forceps removed. The same step is carried out on the other side.

b. Two openings are made in the peritoneum, instead of one.

c. A separate stitch with long ends is used for closing the peritoneal slit and also two other stitches with long ends are introduced for taking care of the loop on each side. That is, eight sutures, each with long ends, are used, as against two in the modified technique.

B. THROUGH INGUINAL CANALS.

XII. Extraperitoneal Shortening of Round Ligaments Through Long Incisions.

(ALEXANDER-ADAMS-EDEBOHLS TECHNIQUE.)
(GOLDSPOHN TECHNIQUE.)

1. An incision two or three inches (5 to 7 cm.) in length is made over each inguinal canal. The incision is placed just above Poupart's ligament and extends from the pubic spine about half way to the anterior iliac spine (Fig. 81). The

Fig. 81. Extraperitoneal Shortening of the Round Ligaments through Long Incisions (Alexander-Edebohls technique). The location and length of the incisions are shown on the right side. On the left side the incision is spread apart, showing the aponeurosis and the external inguinal ring.

incision extends down through the skin and superficial structures to the aponeurosis. This exposes the external inguinal ring as indicated in Fig. 81. The aponeurosis is then split up to the level of the internal inguinal ring (Fig. 82), thus laying open the whole length of the inguinal canal.

2. The round ligament is then isolated and drawn out. It is at this point that many failures have been recorded. When an attempt is made to isolate the ligament at the external ring, it is very likely to result in failure. The ligament does not ordinarily exist here as a distinct cord, but as a bundle of fibers. This bundle of fibers should be picked up entire (Fig. 82) and drawn out some. This usually

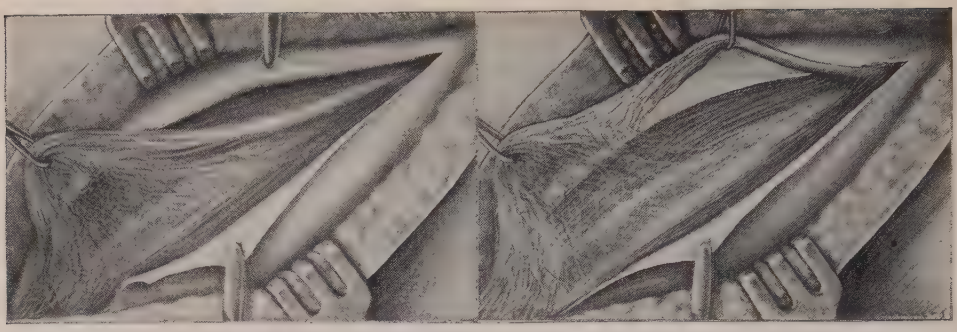


Fig. 82. Fig. 83.

Fig. 82. Catching up the bunch of fibers at the external ring, to bring the compact portion of the ligament into view.

Fig. 83. The compact portion of the ligament identified and isolated.

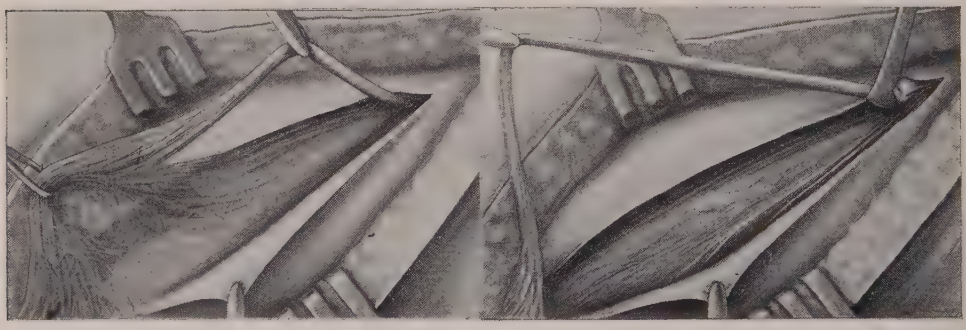


Fig. 84. Fig. 85.

Fig. 84. The ligament caught with an artery forceps preparatory to drawing it out.

Fig. 85. The intra-abdominal portion of the ligament drawn out, the cuff of peritoneum being stripped off by the knife handle.

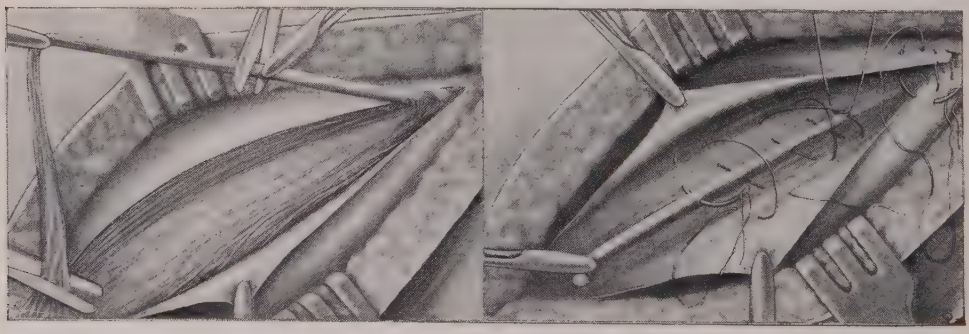


Fig. 86. Fig. 87.

Fig. 86. Excising the excess of ligament.

Fig. 87. Fastening the shortened ligament in the inguinal canal.

brings the compact portion of the ligament within reach, and with care it may be easily isolated from the surrounding tissue (Fig. 83). When fully identified, it is caught with a forceps (Fig. 84) and drawn out as necessary to bring the uterus forward, the peritoneal cuff of the inner portion of the ligament being pushed back as more and more of the ligament is brought out (Fig. 85).

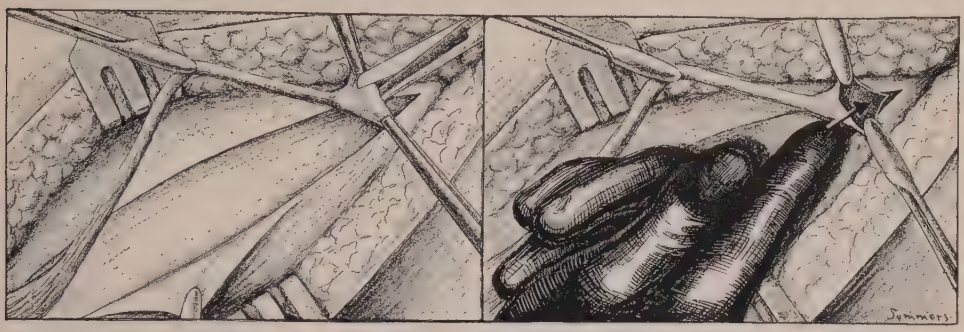


Fig. 88. Fig. 89.

Fig. 88. Goldspohn technique. Opening the peritoneal cuff.
Fig. 89. The finger is introduced into the peritoneal cavity through the opening as indicated by the arrow.

Fig. 90. Both fingers introduced into the peritoneal cavity, for breaking the light adhesions and bringing the uterus well forward. Hands ungloved in illustration for better orientation. They are of course gloved in the operative work.

3. The ligament is then fastened securely in any manner preferred. A very good way is to cut off the excess, as indicated in Fig. 86, and then suture the pedicle in the canal, as shown in Fig. 87.

4. The wall of the canal is then restored in a way to prevent hernia, and the incision closed.

An important modification is that by Goldspohn. The peritoneal cuff is opened (Fig. 88) and the index finger introduced into the opening as indicated in Fig. 89. This maneuver is carried out on each side and by means of the introduced fingers the operator is able to examine the adnexa and uterus, to break up slight adhesions, and to bring the uterus well forward into the desired position, as indicated in Fig. 90. When proposed, the Goldspohn operation was a distinct step in advance but other steps since that time have made it obsolete, except as a means to complete what would otherwise be an unsuccessful Alexander operation. It carries the dangers of intraperitoneal work without the advantages of a median abdominal incision.

XIII. Extraperitoneal Shortening of Round Ligaments Through Very Short Incisions.

(ALQUIÉ-KELLOGG TECHNIQUE.)

1. A short incision is made over the upper part of the inguinal canal of each side. The incision is one inch (2.5 cm.) in length and is situated parallel with and just above Poupart's ligament, the lower end being about two inches (5 cm.) from the pubic spine (Fig. 91, *a-b*). This incision is carried through fat and skin to the aponeurosis, and is spread apart by retractors (Fig. 91).

2. A puncture is then made through the aponeurosis covering the canal and immediately above Poupart's ligament (Fig. 91). Through this puncture a small

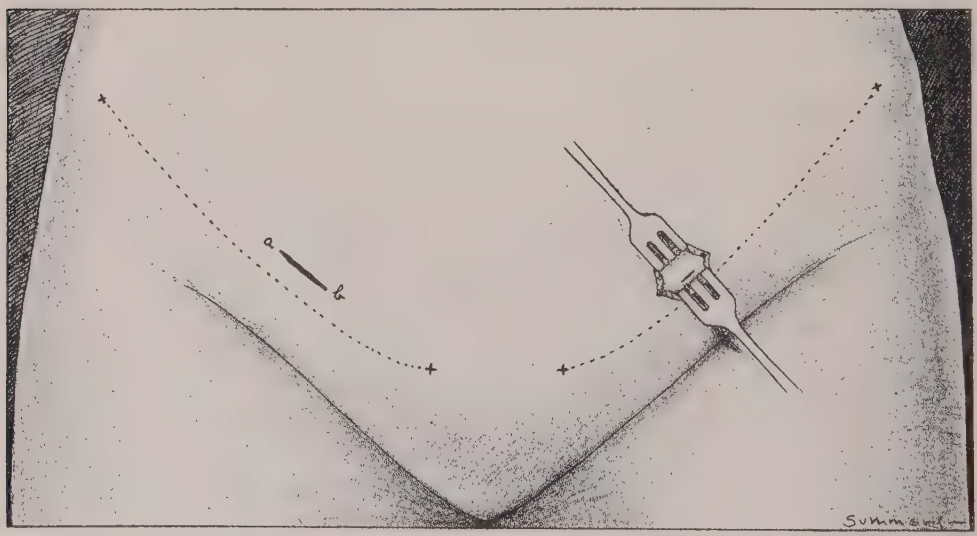


Fig. 91. Extraperitoneal Shortening of the Round Ligaments through Very Short Incisions (Alquié-Kellogg technique). On the right side the line *a*—*b* shows the length and location of the short incision. On the left side the incision is spread apart, showing the location of the puncture through the aponeurosis. The location of Poupart's ligament on each side is indicated by the dotted line.

blunt hook (Fig. 92) is introduced against the inner surface of Poupart's ligament. When the hook is through the aponeurosis it is turned into the tissues of the canal in an attempt to hook up the ligament and bring it out of the puncture. If the ligament is not found the first time, the fishing is continued carefully until the ligament is found and brought out so it can be separated from the other tissues of the canal.

3. The ligament is then brought out sufficiently to bring the uterus forward into proper position. By means of a pedicle-needle the loop of ligament is then

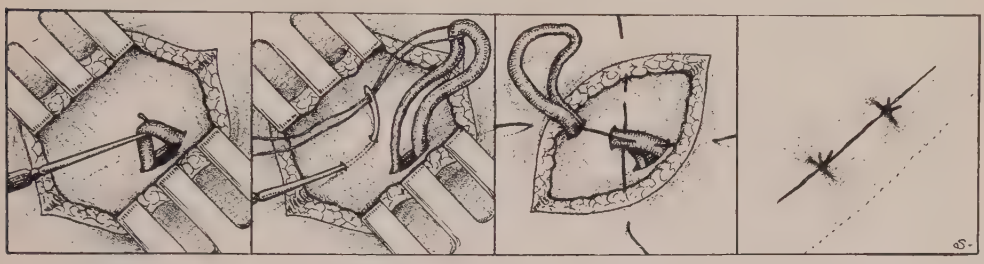


Fig. 92. Fig. 93. Fig. 94. Fig. 95.

Fig. 92. The round ligament caught with a blunt hook and brought out through the aponeurotic puncture.

Fig. 93. A temporary ligature about the ligament-loop threaded into a pedicle-needle, for drawing the ligament-loop under a portion of the aponeurosis.

Fig. 94. The ligament-loop caught in the closing sutures, for secure fastening.

Fig. 95. The short incision closed by tying together first the upper ends and then the lower ends of the sutures.

drawn through a part of the aponeurosis, as indicated in Figs. 93 and 94. The ligament-loop thus secured is still further fastened by passing through it the closing sutures as indicated in Fig. 94.

4. The wound is closed by two silkworm-gut sutures passed as shown in Fig. 94. The upper ends of the sutures are tied together and then the lower ends, giving a firm and neat closure of the small wound (Fig. 95).

XIV. Extraperitoneal Transplantation of Round Ligaments, Giving a Forward Pull.

(FIGUEROA TECHNIQUE.)

1. The skin and superficial fascia on each side are laid open by a two-inch (5 cm.) incision, which begins over the internal inguinal ring and extends inward toward the median line and somewhat upward (Fig. 96). The roof of the inguinal canal is then laid open, the round ligament is drawn well out through the internal ring and a temporary ligature is put about it at the junction of the proximal with the middle third (Fig. 96).

2. Then the index finger, introduced through the internal ring, separates the peritoneum and subperitoneal tissue from the musculo-aponeurotic wall, half way to the median line, as shown in Fig. 97.

3. With a large curved pedicle-needle, guided by the finger, the ligature is carried through the internal ring, along the wall subperitoneally toward the median line and out through the musculo-aponeurotic wall at the inner end of the incision (Fig. 98).

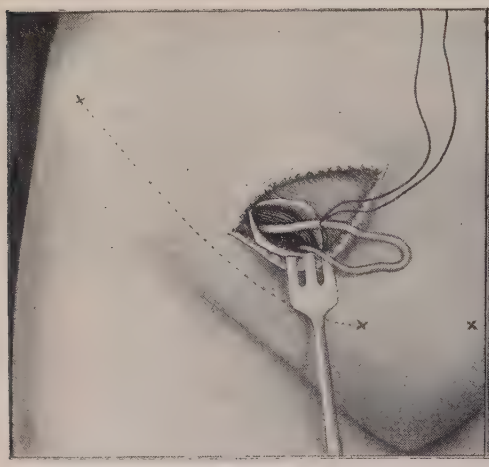


Fig. 96.

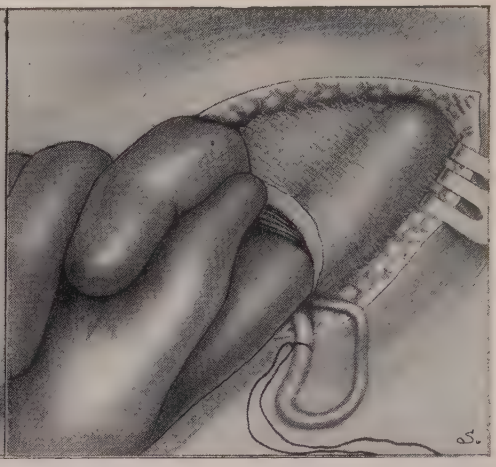


Fig. 97.

Fig. 96. Extraperitoneal Transplantation of the Round Ligaments, giving a Forward Pull (Figueroa technique). The internal inguinal ring exposed and the ligament brought out.

Fig. 97. Finger introduced through the internal ring and carried subperitoneally toward the median line, separating the peritoneum from the musculo-aponeurotic wall.

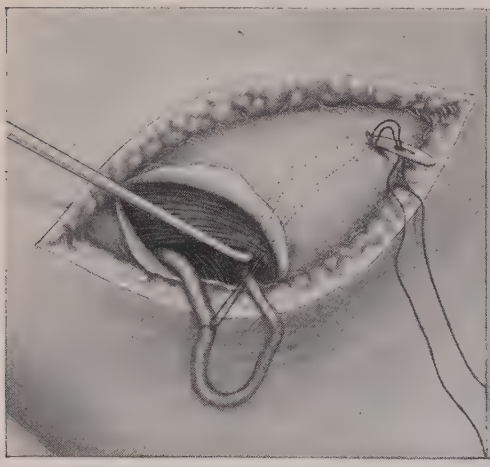


Fig. 98.

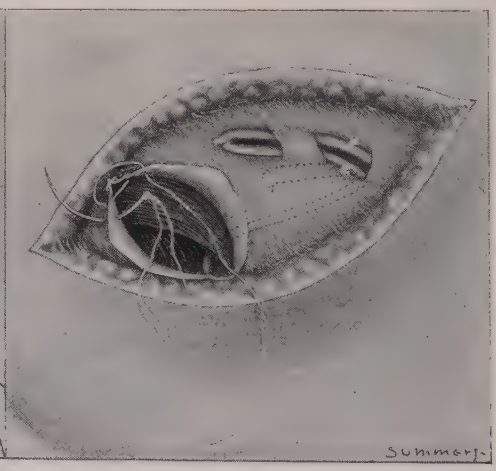


Fig. 99.

Fig. 98. Pedicle-needle, carrying temporary ligature, and introduced subperitoneally under the guidance of the finger, appearing through the musculo-aponeurotic wall.

Fig. 99. The ligament transplanted to its new location, giving a forward pull. The new course of the buried portion of the ligament is indicated in dotted outline.

4. By means of the ligature the ligament is transplanted to the new location, and the excess of ligament is drawn out as a loop on the external surface of the aponeurosis, where it is fastened as shown in Fig. 99.

By this operation the exit of each round ligament is moved halfway to the median line and the shortened ligaments are thus given a decided forward pull.

Furthermore, all the work is accomplished through lateral incisions and without opening the peritoneal cavity. However, it requires two incisions and a very extensive disturbance of tissue on each side and, of course, fails to provide for that intraperitoneal exploration and treatment required in most cases really needing operation for retrodisplacement.

C. THROUGH THE VAGINA.

XV. Vagino-Fixation of Uterus.

(MACKENRODT-DÜHRSSEN-WINTER TECHNIQUE.)

1. An antero-posterior incision is made in the median line of the anterior vaginal vault. If cystocele is present, this incision is continued forward to near the urethral opening. The bladder is then separated from the cervix and also from the vaginal wall far enough out on each side to permit of excision of the slack tissue of the vaginal wall. The bladder may be separated from the vaginal wall by beginning at a central incision and working outward or a short incision may be made near the cervix and the bladder separated from the wall forward and then the wall divided.

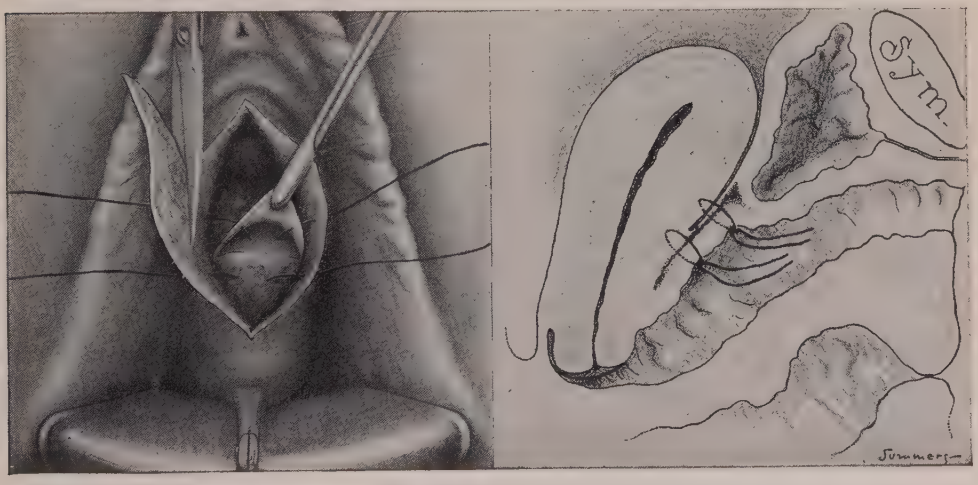


Fig. 100. Fig. 101.

Fig. 100. Vagino-fixation of the Uterus (Mackenrodt-Dührssen-Winter technique). The fixation sutures passed. Trimming off the excess of vaginal wall. The peritoneal opening is to be closed by a running catgut suture.

Fig. 101. Antero-posterior sectional view, showing the results of the operation. The base of the bladder is raised and the corpus uteri is held well forward. Operation not applicable in the childbearing woman.

2. The vesico-uterine peritoneal pouch is opened, the adnexa examined and any needed intraperitoneal work carried out.

3. The fixation sutures are passed as shown in Fig. 100. These may be of chromic catgut, silkworm-gut or silk as preferred. The peritoneal opening is then closed by a running catgut suture.

4. The excess of vaginal wall is trimmed off (Fig. 100), so as to form a firm side-to-side sling for the bladder. The vaginal wound is closed by a running suture of chromic catgut, and the fixation sutures are tied. Fig. 101 shows the resulting elevation of the bladder and forward fixation of the corpus uteri.

XVI. Vaginal Shortening of Round Ligaments.

(GOFFE TECHNIQUE.)
(WERTHEIM TECHNIQUE.)
(VINEBERG TECHNIQUE.)

In the Goffe technique, the round ligament of one side is caught and brought down, as indicated in Fig. 102, sufficiently to take up the slack and hold the fundus uteri forward. The loop of round ligament is then sutured in place with chromic catgut or other lasting material, care being taken to extend the suture

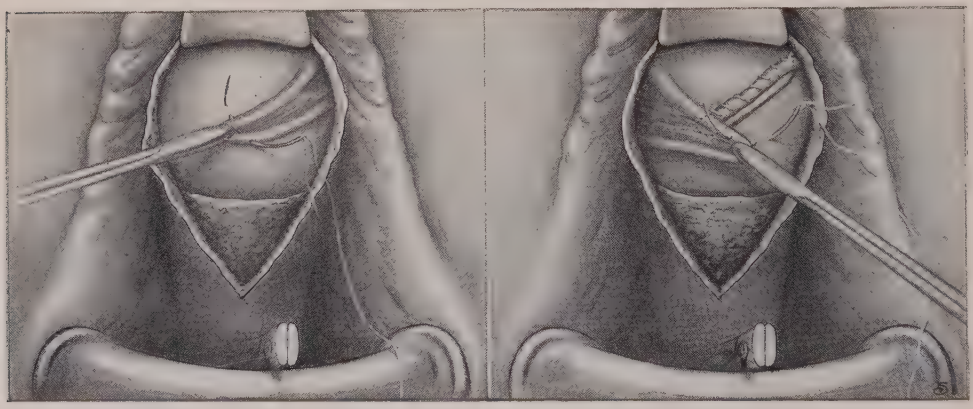


Fig. 102. Fig. 103.

Fig. 102. Vaginal Shortening of the Round Ligaments (Goffe technique). The left round ligament-loop brought into place and the suturing begun.

Fig. 103. Suturing of left round ligament-loop completed. Right loop brought into place.

up to the base of the loop so that the proximal end of the shortened ligament is fastened securely to the horn of uterus. The other round ligament is brought down and fastened in a similar way, overlapping the first if necessary, as shown in Fig. 103.

In the Wertheim technique, the round ligament-loops are fastened to the vaginal wall as indicated in Fig. 104.

In the Vineberg technique, the round ligament-loops are drawn down and fastened farther forward in the vaginal wall and, in addition, vagino-fixation sutures are passed as shown in Fig. 105.

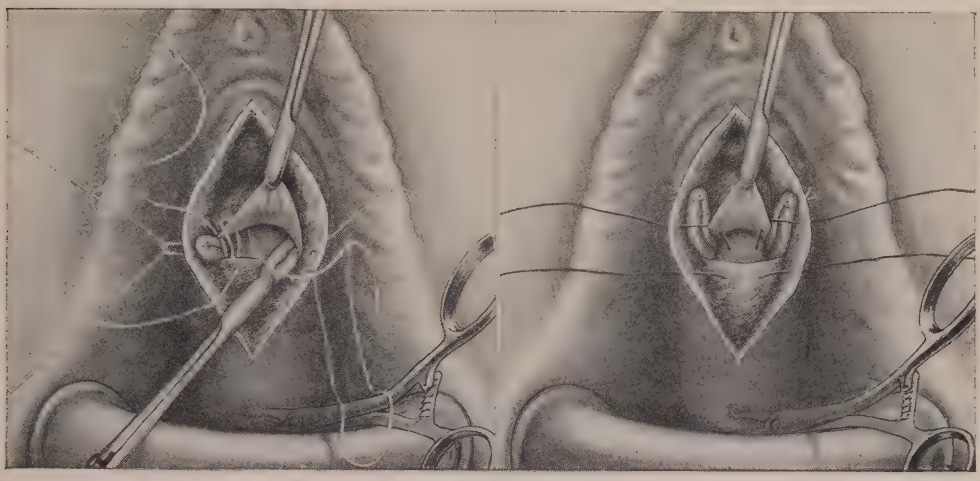


Fig. 104. Fig. 105.

Fig. 104. Wertheim technique. Right round ligament-loop in place. Left round ligament-loop brought into view for suturing.

Fig. 105. Vineberg technique. The ligament-loops fastened in their position far forward. The fixation sutures in place.

XVII. Vaginal Shortening of Utero-Sacral Ligaments.

(BOVÉE TECHNIQUE) (MARTIN TECHNIQUE.)
(JELLETT TECHNIQUE.) (WAGNER TECHNIQUE.)

In the Bovée technique the steps are as follows:

1. A median antero-posterior incision is made in the posterior vaginal vault, the cervix being drawn well down. Through this incision the utero-sacral ligament of one side is partially isolated, caught with a forceps and brought out, as indicated in Fig. 106. A small curved needle, threaded with chromic catgut or other lasting material, is then passed through the sacral portion of the ligament, then through the cervical end of the ligament (Fig. 106), then through the apex of the loop near the holding forceps, and then through that side of the cervix, below the attachment of the ligament, as shown in Fig. 106. This suture is left lax with the ends caught in a forceps, while a similar suture is passed through the other ligament. Then the sutures are drawn tight and tied.

2. The sides of the vaginal incision are then caught and drawn laterally so that the ends come together. The antero-posterior wound thus becomes a transverse one (Fig. 107), and when sutured in that way helps still further to hold the cervix well back in the pelvis.

In the Jellett technique the steps are as follows:

1. A circular incision is made all the way around the cervix. The vaginal wall is loosened from the cervix and pushed up. The cervix is brought forward and the cervical attachment of the utero-sacral ligaments identified (Fig. 108). Each ligament is then seized with a forceps and the ligament severed from the cer-

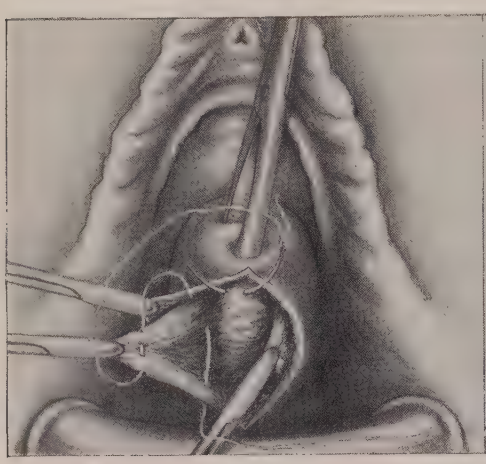


Fig. 106.

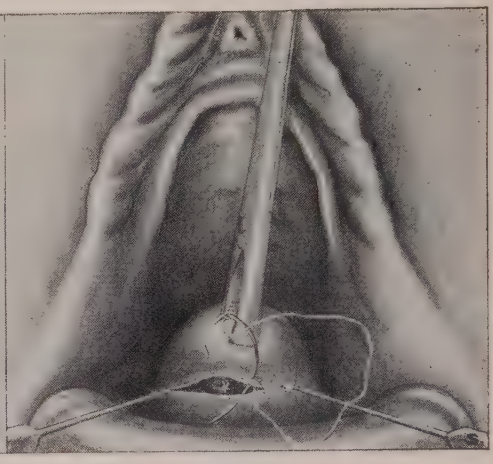


Fig. 107.

Fig. 106. Vaginal Shortening of the Utero-sacral Ligaments (Bovée technique). The shortening-suture in place. The suture is passed first through the sacral end of the ligament, then through the uterine end, then through the center of the loop (held in forceps), then through a point low on the cervix.

Fig. 107. The shortening-suture tied. The longitudinal incision back of the cervix is changed to transverse by traction as here indicated, and sutured in that way. This helps to hold the cervix well back.

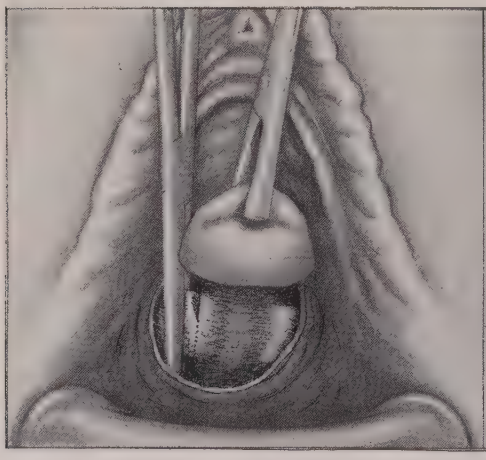


Fig. 108.

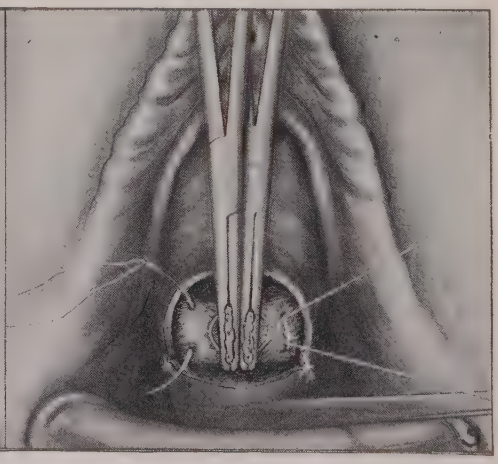


Fig. 109.

Fig. 108. Jellett technique. The utero-sacral ligaments isolated and the right caught with forceps ready for incision. A circular incision has been made around the cervix.

Fig. 109. Both ligaments excised from the posterior surface of the cervix, the cervix pushed back, and the ligaments brought together in front for suturing.

vix as indicated in Fig. 108, and pulled out so that it will come in front of the cervix.

2. The posterior part of the circular incision is then closed by a running suture of chromic catgut. Then the cervix is pushed back as far as desired and the ligament-ends, still held in the forceps, are brought forward and sutured together and to the front of the cervix, as indicated in Fig. 109. The anterior portion of the cervical incision is then closed.

In the Wagner technique, the utero-sacral ligament of each side is severed from its attachment to the back of the cervix and drawn forward through an opening in the broad ligament and sutured in front of the cervix. In the Martin technique the utero-sacral ligaments are not severed from the posterior cervical attachment. Each one is simply caught with a forceps, introduced through the broad ligament, and brought forward as a loop which is sutured in front of the cervix.

XVIII. Elevation of the Cervical Attachment of the Utero-pubic Fascial Plane.

Through an incision in the anterior vaginal vault, the utero-pubic fascial plane is severed from its attachment low on the cervix (Fig. 110, A) and sutured at a higher point (Fig. 111, B) well above the pivotal area of the uterus. This has a very decided effect in keeping the uterus forward.

Fig. 110.

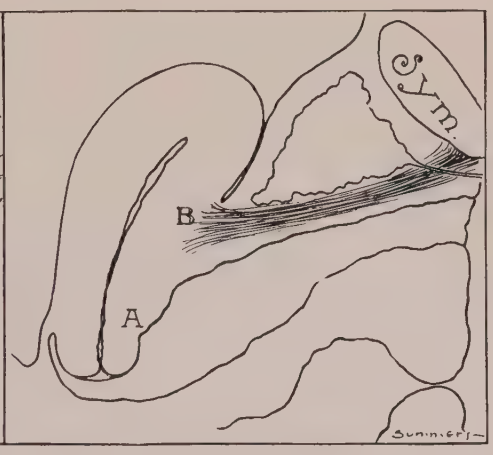


Fig. 111.

Fig. 110. Elevation of the Cervical Attachment of the Utero-pubic Fascial Plane. Showing the attachment of the fascial plane at A. Cystocele tends to drag the attachment low on the cervix.

Fig. 111. Operation completed. The uterine attachment of the fascial plane is raised from A to B, thus elevating the base of the bladder and holding the corpus uteri well forward.

XIX. Lengthening of the Anterior Vaginal Wall.

In certain cases the cervix is held far forward by a short or contracted anterior vaginal wall. Such a condition may be overcome by making a transverse

incision in front of the cervix, through the vaginal wall and other affected tissue (Fig. 112), and then pushing the cervix back, thus converting the transverse into a longitudinal wound (Fig. 113), and closing it by chromic catgut sutures in that position, as indicated in Fig. 114.

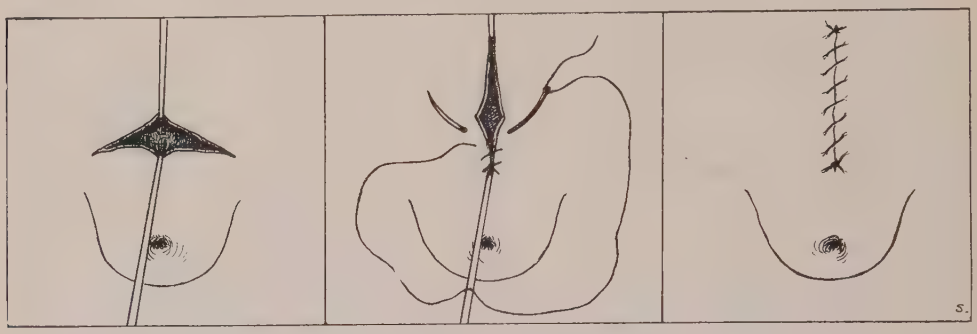


Fig. 112. Fig. 113. Fig. 114.

Fig. 112. Lengthening of the Anterior Vaginal Wall. A transverse incision is made in front of the cervix, through the contracted wall and other affected tissues.

Fig. 113. The transverse incision is spread apart and changed to a longitudinal one by traction with hooks, as here indicated.

Fig. 114. While the cervix is held well back, the incision is closed in this direction by chromic catgut sutures, thus lengthening the anterior vaginal wall.

INDICATIONS FOR OPERATIVE TREATMENT.

At the outset, attention must be directed to the importance of the selective management of cases of retrodisplacement of the uterus.

By the term "selective management" is meant the careful *selection* of the treatment with a view to securing that which is best adapted to the *exact conditions* present in the *individual* case. The time has long since passed when any particular operation or other form treatment can be properly considered as *the* treatment for retrodisplacement as a whole. In each case the treatment to be chosen depends upon the particular conditions present in that case. A measure that in one case gives an excellent result, may in another case prove a complete failure, not from lack of skill in its execution, but from differing conditions to which it is not adapted. Medical literature is burdened with the descriptions of operations for retrodisplacement, many of which have been urged at one time or another as the cure-all for this affection. On the other hand, comparatively little attention has been given to the work of carefully *classifying* the cases according to the *pathological conditions* present.

A distinct advance is made in the understanding of any disease when its various clinical forms and complications are clearly set forth. A still further advance is made when such classification finds its way into the general work of the profession. The accurate classification of cases of retrodisplacement of the uterus, with regard to the exact conditions present, is a subject which should receive

more general consideration and discussion than has hitherto been accorded it, for it is upon this accurate knowledge that effective treatment must rest.

The work of recent years has added to our knowledge a great deal of useful information concerning the pathological changes present in these cases and the effect of the various therapeutic measures employed. When this information is brought to bear upon the question of what is best to do in the case of each patient coming for treatment, then we are in a position to select that treatment which is most likely to restore the patient to health. There are many factors which have an important bearing on the selection of treatment. These factors, when given due weight, divide the cases into several *classes*—each class presenting certain *definite indications*, which point the way to effective treatment.

Starting with the usual division of the cases, according to the mobility of the uterus, into "freely movable," "partially movable" and "fixed," it is helpful to further group the cases under subheads. As the author is speaking from personal experience, and wishes to make this useful in the experience of others, the cases are taken up as they are encountered in office work and at the operating table.

A patient comes for examination, and is found to have backward displacement of the uterus. An attempt is made to raise the corpus uteri by pressing it upward with the examining fingers. If the body of the uterus can be easily raised, it is raised further until the fundus can be caught with the abdominal fingers and brought forward, thus bringing the uterus into proper position. If the corpus uteri cannot be raised with the examining fingers, then a tenaculum-forceps is slipped in beside the fingers and the cervix caught and brought forward. This brings the whole uterus toward the front of the pelvis and allows the fundus to swing clear of the sacral promontory, under which it is sometimes caught. Again, in bringing the uterus down, it is brought closer to the examining hand, which enables the fingers to pass further up its posterior surface and thus work to better advantage in attempting reposition. If the fundus uteri can now be raised, it is brought forward as before described. When the fundus uteri can be brought well forward, the uterus is said to be "freely movable," when it can be brought only part way forward it is classed as "partially movable," and when it cannot be moved to any considerable extent it is said to be "fixed."

Uterus Freely Movable.

That class of cases in which the uterus is freely movable and can be brought well forward, presents many subclasses, requiring different methods of treatment.

1. *Pessary.* Ordinarily when the uterus can be brought well forward without trouble, the adjustment of a suitable pessary is the preferable form of treatment. If the uterus is held in proper position by a suitable pessary for a few months, readjustment of intrapelvic conditions is favored and operation may be found unnecessary.

2. *Knee-chest posture* in combination with pessary. If the uterus shows a tendency to go backward after replacement, add the knee-chest posture. It may be taken for one or two minutes, morning and evening. The best time usually is

just after retiring at night and just before rising in the morning. This aids materially in keeping the uterus forward and also diminishes the dragging and pelvic distress, by taking off the downward pressure temporarily.

3. *Knee-chest posture alone.* There are certain cases in which it is preferable to use the knee-chest posture without the pessary.

a. In cases where the pessary causes pain or so much irritation as to make the patient uncomfortable.

b. In virgins, where local treatment is always to be avoided if possible. In some of these cases the knee-chest posture will bring the uterus fairly well forward and relieve the distress.

c. In certain neurasthenic or hysteric individuals, it is advisable to avoid local treatment, so as to avoid fixing the patient's attention on the lesion of the genital tract. In such a case the knee-chest posture may be given as part of a course of general exercise, and thus the desired effect may be secured without the patient suspecting any pelvic disease.

d. In early pregnancy, where the pressure of the foreign body in the vagina might cause irritation. In many of these cases the knee-chest posture is sufficient. When it does not prove satisfactory, then the pessary may be tried, either alone or in conjunction with the knee-chest posture.

4. *No treatment.* There are certain cases at the extremes of the period of uterine activity, in which the displacement causes no disturbance and hence requires no treatment.

a. A small virgin uterus is sometimes found displaced with no symptoms due to the displacement. These patients are usually examined for dysmenorrhœa and are often entirely relieved by dilatation and curettage without permanent correction of the retrodisplacement.

b. In the case of small senile uteri, found in women long past the menopause, it seems to make little difference whether the atrophied organ lies forward or backward. A careful investigation of these cases will usually show something else to account for the pelvic symptoms—frequently senile vaginitis and vulvitis, leading to pruritus vulvæ.

5. *Intraperitoneal treatment.* The following cases of retrodisplacement with freely movable uterus, require abdominal section or vaginal section.

a. Cases complicated by ovarian or tubal disease requiring intraperitoneal investigation and treatment.

b. Cases complicated by appendicitis. In these, the appendix should be removed at the same time that the uterus is fastened forward.

c. Cases presenting uncertain conditions, in which the probability of some serious lesion (tumor, inflammation, adhesions) makes advisable intraperitoneal investigations along with the correction of the displacement.

d. Cases in which the employment of pessary and knee-chest posture does not keep the uterus forward satisfactorily.

e. Cases in which the pelvic distress persists in spite of the uterus being kept forward by nonoperative measures. In such cases, before operation is resorted

to, a most careful investigation should be made to determine certainly that the pelvic distress is really due to a pathological condition of the uterus or adnexa, and not to some general disease (nervous, nutritive, circulatory) or to simple local neuralgia.

6. *Perineorrhaphy.* If there is relaxation of the pelvic floor, permitting the cervix to sink downward and forward, the pelvic floor should be repaired at the same time that the fundus uteri is fastened forward. In exceptional cases in which the movable uterus stays forward well with a pessary, repair of the pelvic floor may be all the operative work necessary.

7. *Alexander's operation.* This shortening of the round ligaments without opening the peritoneal cavity, may be employed in cases where the uterus stays well forward with a pessary, but for some reason the pessary cannot be worn or there is a desire to discard it. The field for this operation is very limited. The uterus must be freely movable. It must stay forward easily with a pessary, thus excluding adhesions and other complications that would tend to draw it backward and make the operation a failure. There must be no appendiceal, tubal or ovarian condition requiring operative treatment or exploration. Most of the cases in which the pessary and knee-chest posture are not effective, require opening of the peritoneal cavity, because of the certainty or probability of intraperitoneal complications.

Uterus Partially Movable.

This class includes the majority of cases of retrodisplacement. Following the displacement or coincident with it, there has been some inflammation, leaving as sequelæ adhesions and infiltration, which limit the mobility of the uterus. Here, also, are subclasses requiring different methods of treatment.

1. *Bimanual stretching of adhesions or infiltrated tissues.* In these cases, the object of the bimanual manipulation is to raise the corpus uteri as far as it will go and then stretch the restraining tissue, so it can be raised still further. This *stretching* should be done *gently,* so as not to tear tissue or cause severe pain. Each movement should be made with the definite object of stretching some resisting tissue, and practically all the movements are made in the direction of reposition of the uterus, i. e., either raising the fundus and bringing it forward or pushing the cervix backward. In many cases of long standing backward displacement, the cervix is held forward by shortening and infiltration of the tissues in front of it. This shortening must be overcome by gradually carrying the cervix far back in the pelvis and thus lengthening the shortened tissues.

2. *Knee-chest posture and pessaries.* In cases where the uterus cannot be brought entirely forward, the patient should take the knee-chest posture twice daily, in order to assist in holding what is gained by the treatments. If desired, a vaginal tamponade may be used after each treatment. When the fundus uteri has been raised far enough to permit the cervix being pushed well back in the pelvis, it is sometimes advantageous to introduce a suitable pessary of the Hodge or

Smith or Thomas type, even though the fundus has not been brought entirely forward. The pessary thus placed holds the cervix well back in the pelvis, and thus assists in keeping the fundus raised and in bringing it forward in the knee-chest posture. When the uterus cannot be replaced, considerable temporary relief from the dragging may be given in some cases by using the inflated ring pessary. This pessary has no particular action in maintaining the uterus in a forward position, but simply lifts up the whole uterus a short distance, and thus relieves some of the dragging. The effective use of pessaries, knee-chest posture and other nonoperative measures has been taken up in detail by the author in his text-book—Diseases of Women.

3. *Intraperitoneal treatment.* The fact that the mobility of the uterus is limited, is evidence in itself of some pathological condition in the pelvis, in addition to the uterine displacement. A large proportion of these cases require intraperitoneal operation, either at once or after a trial of palliative measures. Before subjecting the patient to operation, care should be taken to determine that the limitation of mobility is not due simply to the sequelæ of an old cellulitis about the uterus. This infiltration of connective tissue, whether it fixes the uterus little or much, cannot be corrected satisfactorily by intraperitoneal operation and should not be taken as an indication for such operation. As mentioned below, it is in this class especially that gradual stretching of the involved tissues is indicated.

Uterus Fixed.

Even in the cases of firmly fixed uterus, there are subclasses requiring different methods of treatment.

1. *No treatment.* Occasionally a displaced adherent uterus gives rise to no symptoms. In the childbearing period, when the uterus is large, heavy and functionating, its displacement practically always causes troublesome symptoms as long as the uterus is at all movable. On the other hand, if the uterus is firmly fixed, so firmly as to prevent dragging, it may give no trouble. An occasional instance of this kind has come under the author's observation, and such cases are very instructive, for they indicate that the symptoms in displacement are due not so much to the abnormal location of the corpus uteri as to the dragging on stretched and tender structures. This same fact is of much importance also in operatic treatment and indicates the wisdom of choosing those forms of operation which not only bring the uterus forward, but at the same time elevate it, and thus overcome the dragging and partial prolapse which is usually present in these cases.

2. *Stretching of adhesions, knee-chest posture.* In cases not suitable for operation the persistent employment of these measures may secure considerable relief. Bimanual stretching of the tissues, with the other nonoperative measures, is indicated especially in those cases of fixation due to sequelæ of *pelvic cellulitis* without tubal involvement. They are the cases, also, which cannot be satisfactorily handled by intraperitoneal operation, for the lesion is not in the peritoneal cavity, but in the connective tissue.

Again, the patients with intraperitoneal adhesions, who are not in physical condition for operation, or who refuse operation, may in some cases be given considerable relief by these measures faithfully employed. If there is much inflammation, treatment for that also is of course indicated.

3. *Intraperitoneal treatment.* In most cases, the fixation is due to adnexal inflammation with intraperitoneal exudate and adhesions. If of long standing, operation is required for its relief. If the inflammation is of recent origin, palliative measures are to be given a trial, with operation later if necessary. In some cases the fixation of the uterus is due to a tumor requiring removal.

CHOICE OF OPERATIVE METHOD.

Under "Indications" for operative treatment have been given (a) the various classes of cases requiring nonoperative treatment, (b) the various classes of cases requiring intraperitoneal operation, and (c) the few cases that may be handled satisfactorily by extraperitoneal shortening of the round ligaments. Of course, in any case where there is marked relaxation at the pelvic outlet, repair of the damaged pelvic floor must be added to the other operative measures employed.

In nearly all cases in which nonoperative measures prove insufficient, there are complicating conditions requiring intraperitoneal treatment. This intraperitoneal treatment may be carried out through an abdominal incision or through a vaginal incision—depending upon the preference of the operator and the conditions present in the particular case.

ABDOMINAL SECTION.

In the majority of cases requiring intraperitoneal treatment, the complicating lesions and the retrodisplacement itself can be most satisfactorily treated through an abdominal incision. When the abdomen has been opened and the adnexal lesion or other lesion taken care of, then comes the question:

What Method Should Be Employed to Hold the Uterus in Anterior Position?

This is an important question and one which confronts the gynecologist daily in his work. The answer varies with the conditions present.

A dependable presentation of this subject implies a careful consideration of the various operative measures devised and of their adaptability to the correction of the pathological conditions present in different patients. Such consideration should be as free as possible from that personal bias which tends unconsciously to make out a case for some particular operation, and also from that snap judgment which mistakes a few supposed facts, assertively proclaimed, for a balanced consideration of the subject.

As a guide to the choice of operation, the author thought of presenting series of reported cases operated on by each of the various methods, with the immediate

and the remote results. A study of such series, however, showed that they presented no satisfactory solution of the problem. There is a marked sameness about the reports of series of cases operated on by the various methods. The contents of most of such reports may be summarized as follows:

One hundred patients (more or less) were subjected to the operation. About ninety per cent did well afterward—hence the operative method reported is the one to be chosen in cases of retrodisplacement.

Such a conclusion, backed by a large series of cases, is swallowed whole by the unsophisticated. And soon there appear other reports of series of cases subjected to the same operation with the same result (most patients doing very well) and the same dogmatic conclusion (that that is the best operation for retrodisplacement). The more patients subjected to the operation, the stronger the argument becomes—to the novice. One common variation from the above routine, is to "go to the foundation principles" by citing a few anatomical or physiological or embryological facts or fancies favorable to the operation to be later presented leaving, unconsidered, overbalancing features just as well or perhaps better established. Another variation, used occasionally with telling effect, is to cite the fact that, of the cases operated on by some other popular method, about ten per cent did not do well. This clinches the argument—ninety per cent by his method did well and ten per cent by the other method did not do well!

By such arguments we can arrive nowhere—and that is just where many operators seem to be at present in regard to dependable conclusions on this subject.

There are good reasons for the present confusion. The subject is comparatively new. Certain factors in uterine support are not yet fully understood in physiological conditions and much less in pathological conditions. There are, in most cases, associated lesions, the importance of which in the clinical picture have only in recent years begun to be appreciated. For a conclusive study of the subject, it is necessary that there be an accumulation of a large number of carefully studied cases in which various supposed principles have been put to actual test. This is necessary even where the principles can be approximately formulated before testing, and much more so where the principles themselves must, to some extent, be worked out gradually by observation at the operating table. The criticism is not directed to the present unsettled condition, which is the usual accompaniment of the developmental period of any large and intricate subject. Neither is it directed to the series of reported cases with simple presentation of facts and sustained conclusions. What the author does criticise and hopes to discourage, is the too prevalent practice of assuming to explain the whole subject from a rather superficial study of some one phase of it. We must separate facts from fancies if we would make real progress. We must study the subject in a broad way, taking into consideration the various features and, particularly, determining the different pathological conditions and the operative measures most suitable for each. Some years ago (Jour. A. M. A., Vol. 48, p. 1488) the author emphasized the necessity of such study and classification and individual adaptation.

There has been an encouraging growth of such study and we have come a long way on the road of progress in the last few years.

In the first place, it is well to recall the fact that, in spite of the large amount of good work, there still remains considerable uncertainty in regard to some features of uterine support. There is the question of the relative importance of the various factors in health under usual conditions and under unusual conditions, in the different types of pelvis and in the different postural habits. There are, also, the many pathological conditions resulting from inflammation, childbirth, occupational strains, depressed general health, neurologic conditions, etc. There are anatomic, physiologic and pathologic phases of the subject that are still a bit hazy. The mechanics of intra-abdominal pressure in different types of bodies and in different occupational postures and developmental conditions, present some interesting questions that await a conclusive answer. Concerning the different tissues utilized in operations for support, the sustaining power of each in the situation used and under the varying conditions of health and disease, has not been fully determined.

The following may be taken as a safe working basis. If any fancies have been counted as facts, the author will be pleased to be shown.

1. Most of the symptoms in retrodisplacement cases are due to complicating conditions. These complications must be recognized and treated if the symptoms are to be relieved. The complications determine to a very large extent the method of treatment to be employed for the displacement.

2. Normally the uterus is maintained in position by a combination of structures. In any scheme of restoration, either this combination support must be restored or some one or two or three supporting structures must be strengthened sufficiently to supply the support of missing factors as well as their own quota.

3. Pelvic floor support is necessary to permanent correction of retrodisplacement and hence repair of the floor is necessary whenever that structure is seriously relaxed.

4. When decided prolapse of the uterus can be excluded, the problem, after treatment of the complications, resolves itself into maintaining the corpus uteri in the anterior portion of the pelvis and the cervix in the posterior portion, with sufficient elevation of the uterus and adnexa to prevent dragging on hypersensitive attachments.

5. As the problem varies with the special condition present, the operator should have a definite working plan based on a classification of cases according to these important conditions. If such a plan be adhered to, in operative work and in reports of cases, it will mean substantial progress in two directions. In the first place, there will be more individual study of cases, to determine definitely the complicating conditions, and hence a better selection and adaptation of operative methods to pathological change. Secondly, there will accumulate a large number of reported cases in which various methods have been carefully tested

in cases really suitable for those methods. Such material will make possible a balanced consideration of the subject and dependable conclusions. The following is a good working plan:

CLASSIFICATION OF CASES

FOR SELECTION OF OPERATIVE MEASURES.

A. Future Pregnancy Possible.

I. Adnexa of both sides intact and tissues freely movable.
II. Ovary and tube of one side removed.
III. Pelvic tissues infiltrated and stiffened.
IV. Varicose veins of broad ligament.
V. Cervix far forward.
VI. Relaxed pelvic floor.
VII. Lax abdominal wall.

B. Pregnancy Not Possible.

I. Active uterus preserved.
II. Senile uterus preserved.

A. Future Pregnancy Possible.

When future pregnancy is possible, no method of fastening forward the uterus is permissible which could interfere seriously with pregnancy or parturition. This excludes at once ventro-fixation and ventro-suspension.

Ventro-suspension has been employed hundreds of times in the childbearing period, with good results. However, a large number of serious results, also, have been reported from subsequent pregnancies. As long ago as 1905, Lynch collected a number of cases in which Cæsarean section was necessary because of the effect of this operation. It is the *uncertainty* as to the amount of suspension or fixation which will result, that makes the operation dangerous in the childbearing period. The object of the operation is to form a short suspension band, strong enough to hold the uterus forward and upward, but that will not interfere with the development of the uterus in pregnancy. But reported cases show that when the fundus uteri is once sutured to the abdominal wall there is no certainty as to just how much suspension or fixation will take place. From the ideal result the uncertainty extends in both directions, i. e., there may result a firm fixation to the abdominal wall causing a disastrous result in a subsequent pregnancy, or, on the other hand, the suspension band may become so slight and attenuated that it fails to hold the fundus forward, and there is recurrence of the old displacement. Again, there is danger of the intestine becoming entangled about such long bands, with resulting intestinal obstruction. These bad results have occurred often enough to make them valid objections, and accumulated experience

has demonstrated unquestionably that this operation should not be employed when future pregnancy is to be reckoned with.

As to what method *should* be employed when pregnancy is possible, that depends upon the particular conditions present in the pelvis. The various conditions will be considered according to the above classification.

I. Adnexa Intact and Tissues Freely Movable. In this class of cases the following operations may be used:

1. *Transplantation of round ligaments into the abdominal wall.* After trial of various methods and modifications, the author has settled on transplantation of the round ligaments into the abdominal wall by his modification of the Gilliam technique as the most satisfactory operation for cases of this class. The steps in this operation are shown in detail in Figs. 6 to 19 and the text connected therewith. Notice that the forceps, for catching the round ligaments, penetrates the rectus muscle near the median line down to the peritoneum, and then passes along just under the peritoneum to the outer end of the round ligament. There the forceps-point is forced through the peritoneum and is made to grasp the middle of the round ligament. Thus the forceps penetrates the strong, fixed musculo-aponeurotic wall near the median line and the movable peritoneum laterally at the round ligament. Consequently when the ligament is drawn into place along this tract, the movable peritoneum slips toward the muscle-opening near the median line, giving a strong forward pull, but leaving no dangerous lateral opening as in the regular Gilliam operation. Also, the ligament-loop is sutured under the protecting aponeurosis instead of above it. When the ligament-loop is sutured above the aponeurosis, as in the Gilliam operation (Figs. 2, 3), it may cause a persistently tender lump there. In one such case seen by the author it was finally necessary to cut down and remove the tender mass of tissue. In the Simpson-Montgomery operation (Figs. 24 to 27) and the Mayo modification of it (Figs. 28, 29), there is more disturbance of the deep tissues of the musculo-aponeurotic wall and the region of the internal ring with its important inferior epigastric artery and vein, hence there is more danger of vessel injury and hematoma. The penetration of the musculo-aponeurotic wall is made further to the side, consequently there is not such satisfactory forward pull.

In seeking to improve the technique of this transplantation operation, as the result of experience year by year, the author has kept in mind the following points:

a. The technique should be simplified as much as possible so that the operation may be executed quickly without the sacrifice of accuracy. This rapidity of execution is important because the retrodisplacement operation is in many cases only a step in a series of operations required to correct a combination of lesions present. Removal of pelvic growths or inflammatory lesions, appendectomy, curettage, repair of cervix or repair of pelvic floor, are not infrequently required—and still the total time of operating must be kept within

safe limits so that the patient be not subjected to undue strain. That means that each step in the series must be completed in a short time.

b. Avoid working blindly in the tissues. Follow the point of the forceps through by sight or touch. This makes for safety in avoiding the bladder and deep vessels and for accuracy in placing the ligaments where the pull will be most effective. At first thought this may seem to add to the time, but experience shows that it reduces the time, for the steps are then executed promptly without the hesitation and repetition incident to the inaccuracies of blind work. Notice in the illustrations of this operation (Figs. 6 to 19) how the parts are separated so that the location of the forceps-point may be clearly seen or felt at all stages of the work. An attempt was made for a time to keep the point in sight all the way through, but it was found that the forceps-point could be guided along under the peritoneum of the abdominal wall out to near the distal end of the round ligament, better by touch than by sight. It was found to be a decided advantage to mark the site for puncture of the peritoneum by catching it with a forceps as shown in Fig. 16. Two fingers within the abdomen then guide the forceps-point along under the lateral peritoneum to the marker. The marker is then removed, and the forceps-point is forced through the peritoneum at this site, between the two guiding fingers which furnish the required resistance.

c. Eliminate special instruments. Special instruments add to the already large number of instruments required regularly for these combined operations. Also, the special instrument is not always at hand or in good order when needed. The author has been working toward the elimination of the special puncturing-tenaculum forceps, and has now succeeded in doing so. The technique used at present can be easily carried out with the regular instruments, the transplantation tract being made and the ligament grasped and brought back through it by an ordinary curved pedicle clamp, as shown in Figs. 16 and 17 and the accompanying text.

This operation elevates the adnexa as well as the fundus uteri, and completely corrects the lesion in most cases of uterine retrodisplacement of the class under consideration. Occasionally an ovary lies so low that a stitch in the uteri-ovarian ligament is advisable. When the utero-sacral ligaments are greatly overstretched, so that there is marked prolapse of the cervix, *shortening of the utero-sacral ligaments* also is advisable. The preferable technique for shortening of the utero-sacral tissues is shown in Figs. 69 to 80.

2. *Posterior implantation of the round ligaments.* This operation, shown in Figs. 33 to 35, gives a good forward and upward location to the corpus uteri and adnexa, and has been used extensively with good results. However, it utilizes the outer weaker portion of each round ligament for the support, which portion is most likely to stretch and allow recurrence under strain. Another disadvantage is that drawing the round ligament through the broad ligament disturbs the venous plexus of that structure and increases the danger of iliac thrombosis, at least in the cases where the veins of the ovarian

plexus are dilated and varicose. In one large series of cases (Polak—Jour. A. M. A., Vol. 61, p. 1430) operated on by this method, postoperative iliac thrombosis occurred in seven per cent of the cases. In clean pelvic operations generally, even of the severe type, iliac thrombosis ought not to run more than two per cent, and when muscular activity is begun early in convalescence, it is very much less. This is a troublesome postoperative complication, and if extended experience shows that this method properly applied in suitable cases really causes it, the operation would be contraindicated thereby. However, the thromboses were probably due principally to conditions present before operation rather than to the operation itself. There is nothing in the report to indicate that unsuitable cases were eliminated. When the broad ligament veins are diseased, as when varicosities are present or there is inflammatory infiltration of the broad ligament tissues, drawing the round ligaments through the diseased area would naturally tend to thrombosis. But it has not been shown that the operation produced thrombosis in cases where the broad ligaments were normal.

3. *Intraperitoneal folding of round ligaments.* Simple folding of the round ligaments is easily carried out by any one of the methods shown in Figs. 38 to 44. However, the resulting pull is lateral instead of forward and hence is not effective in cases where there is much backward tendency. Also, the shortened tissues are likely to stretch under moderate strain, because the union is principally between peritoneal surfaces, and in addition, dependence is placed on the weak outer extremity of the ligament. The author employs this method only in cases where there is very slight backward tendency, principally as a prophylactic measure in patients operated on for other conditions and in which the ligaments are found too lax. He tried it as a regular combination measure with utero-sacral shortening in retrodisplacement cases. It seemed at first to work very well, but the follow-up in these cases showed an occasional recurrence, so he went back to the more effective transplantation operation.

II. Ovary and Tube of One Side Removed. The removal of the tube and ovary fixes the tissues of the broad and round ligaments more or less. The amount of fixation depends upon the amount of inflammatory infiltration and the technique employed in adnexal removal. As a rule, however, even though the adnexal removal is carried out with particular care to avoid suture-fixation of tissues, the mobility of the round ligaments or of the uterus is interfered with sufficiently to make the transplantation operation inadvisable. In such cases the author usually employs *posterior folding of the round ligament over the pedicle.* By this method, shown in Figs. 36 and 37, the adnexal pedicle is well covered by the same maneuver that fastens the corpus uteri forward. The ligament is folded on the posterior surface of the uterus sufficiently to take up the slack and give forward traction. As the uterine attachment of the active portion of the ligament is moved farther back, there is a

better forward pull. The opposite ligament may be folded upon itself (Figs. 41 to 44) or it may be folded over the top of the uterus (Fig. 61), or it may be drawn backward through the broad ligament (Figs. 33 to 35). Whatever method is employed, the shortening should be adjusted to correspond with that on the side first treated, so that the uterus will not be drawn laterally to a marked extent. The combination of operative measures frequently required in these cases is shown in Figs. 219 to 223, which represents a case complicated by some prolapse of uterus and bladder.

Removal of an ovary only, usually interferes but little with the mobility of the round and broad ligaments, hence such a case is suitable for the operative methods recommended for the first class, except drawing the round ligaments backward through the broad ligaments.

III. Varicose Veins of Broad Ligaments. If the tissues are freely movable, such a case is suitable for the operations mentioned for the first class, except drawing the round ligaments through the broad ligaments.

If the varicosity is so marked that treatment of the veins (ligature and incision or excision) is required, then the broad-ligament tissues become fixed, as in the cases of the class next mentioned.

IV. Pelvic Tissues Infiltrated and Stiffened. The method to be chosen for forward-fastening of the corpus uteri in these cases, depends on the extent of the fixation of the tissues.

1. *Round ligament transplantation with short loop.* Where the uterus and adjacent tissues are still sufficiently movable to permit a short loop of each round ligament to be brought into the abdominal wall, that is the preferable operation. The operation is executed as detailed in Figs. 20 to 23 and accompanying text. This gives a strong forward fastening.

2. *Round ligament suturing over the top of uterus,* as shown in Fig. 61, is easily executed and gives a forward fastening which is fairly good, though not so strong as transplantation into the abdominal wall as above recommended.

3. *Round ligament suturing to abdominal wall.* Occasionally the broad ligament tissues are so infiltrated on one or both sides that the fundus uteri cannot be brought well forward. It can be raised far enough to relieve symptoms from retrodisplacement, but cannot be brought close enough to the wall to permit transplantation of a loop of the infiltrated and fixed round ligaments. In such a case the problem is to maintain the corpus uteri in its position of partial replacement. In the author's experience this is best accomplished by suturing the lateral tissues, comprising the infiltrated round ligaments and adjacent portions of the broad ligaments, to the abdominal wall, as shown in Figs. 45 and 46 and accompanying text.

V. Cervix Far Forward. In these cases of prolapse of the cervix, in addition to the work for holding the fundus uteri forward, the utero-sacral tissues should be shortened as shown in Figs. 69 to 80 and accompanying text.

In these cases it is important, also, to make particularly strong repair of the pelvic floor.

VI. Relaxation of Pelvic Floor. When the pelvic floor is decidedly relaxed, as it usually is, it should be repaired as shown in Chapter IV.

VII. Lax Abdominal Wall. Exceptionally the abdominal wall is so lax that it can furnish no support for the uterus even though the round ligaments be securely transplanted into it. In such a case the support must be taken from the pubic bone—that is, the line of tension, extending from the pubic bone along the rectus tendon and the shortened ligaments to the uterus, must be short enough to keep the uterus up and forward.

Just recently the author has had to operate on a case of this kind. In another instance of this condition, the patient came to the author for examination about eight weeks after operation by a general surgeon who had evidently failed to recognize the condition, or at least had failed to deal effectively with it. The lax abdominal wall dipped into the pelvis and allowed the uterus, which was fastened to the wall, to lie back in its old position of retrodisplacement.

Another point of importance is that patients with this lax condition of the wall should receive, either before or after operation, a thorough course of special exercises directed toward restoring tone and strength to the atrophic abdominal muscles.

B. Pregnancy Not Possible.

The elimination of the possibility of pregnancy in the childbearing period may be due to complete removal of the adnexa of both sides or to the removal of both tubes or to the removal of both ovaries. When one or both ovaries are retained, the preservation of the uterus may be advisable in order to maintain menstruation. When both ovaries are removed, it is advisable to remove the uterus if it presents any abnormality likely to give trouble, unless the patient definitely desires otherwise.

Likewise, when the patient is past the menopause, if the displaced uterus presents any other abnormality that may cause further disturbance, it is ordinarily advisable to remove it rather than to fasten it forward.

In the cases with future pregnancy eliminated, there are two kinds of retrodisplaced uteri preserved.

I. *Active uterus preserved.* In these cases the uterus is still normally large and heavy and requires secure forward fastening. Strong, ventro-fixation (Figs. 47 to 51) is the method of choice when the uterus is sufficiently movable for the fundus to be easily brought against the abdominal wall. When the fundus will not come easily to the abdominal wall, then it is well to fold the round ligaments over the adnexal pedicles (Figs. 36 and 37), fastening the ligaments securely to the posterior surface of the uterus. If preferred, the round ligaments may be folded over the top of the uterus (Fig. 61) or sutured to the abdominal wall (Figs. 45 and 46).

II. *Senile uterus preserved.* If the uterus has undergone marked senile atrophy, it may, as a rule, occupy any position of retrodisplacement without causing symptoms. If it is thought advisable to fasten the small uterus forward, this may be accomplished simply by folding the round ligaments over the top of the uterus (Fig. 61) or by folding the ligaments on themselves (Figs. 41 to 44).

However, if any definite prolapse of the uterus or bladder is present, treatment for the prolapse, as detailed in Chapter II, is advisable.

VAGINAL SECTION.

In general, it may be stated that vaginal operation for retrodisplacement is indicated in those cases where other vaginal work is needed and lesions requiring abdominal section can be eliminated. As to just what lesions require abdominal section, there is considerable difference of opinion among operators—the variations in practice being due to some extent to personal preference and training. Abdominal section is certainly preferable in cases of appendiceal or intestinal complications, of extensive adnexal inflammation, of adherent retrodisplacement, of large tumors, and of doubtful lesions.

Vaginal shortening of the round ligaments (Figs. 102 to 105) for movable retrodisplacement, fits in very advantageously with plastic operations for repair of the pelvic floor and for cystocele.

Vagino-fixation of the uterus (Figs. 100 and 101) of sufficient extent to insure a permanent result is hazardous in the childbearing period, but it may be used with satisfaction after the menopause, for simple retrodisplacement or for retrodisplacement with slight prolapse and cystocele.

Vaginal shortening of the utero-sacral ligaments, by the Jellett technique (Figs. 108 and 109), may be used in vaginal operation for cases where the cervix is very far forward. It is a rather troublesome operation, however, and is rarely necessary in simple retrodisplacement. Its principal field of usefulness is in cases of prolapse, which cases are considered in the next chapter.

CHAPTER II.

PROLAPSE OF UTERUS AND BLADDER.

The pelvis is spanned by two planes of supporting tissue, one above the other, as indicated in Fig. 115. Each plane is attached to the pelvic wall practically all the way around, so that it forms a fibro-muscular diaphragm with sling action transversely and diagonally as well as antero-posteriorly.

The lower plane or diaphragm lies principally below the vagina and consists of the levator ani muscle of each side, with its fascial sheath formed by the recto-vesical fascia above and the anal fascia below, and supplemental muscular and fascial structures in front and behind. Of the three openings through this fibro-muscular support, the rectal opening is well protected by the sharp bend in the canal and by the superimposed sphincter muscles below, while the urethral opening is protected by the narrowness of the canal and its situation immediately under the resisting bony arch. The vaginal opening is the weak area in the pelvic floor. Under normal conditions it is fairly well protected (a) by its situation, well forward, out of the line of direct pressure, (b) by the direction of the canal being such that intra-abdominal pressure tends to close it instead of open it, and (c) by the overlying upper fibro-muscular plane and body of the uterus.

The upper plane or diaphragm lies above the vagina and comprises two segments—the uterine segment and the vesical segment. Each segment consists of a viscus and its surrounding supports. The uterine supports in the upper plane are (a) the broad ligaments, laterally, (b) the utero-sacral ligaments, posteriorly, (c) the utero-pubic fascial plane, anteriorly, and (d) the fibers between these, extending diagnonally from the uterus to the pelvic wall and completing the fibro-muscular diaphragm. Each broad ligament contains an upper and a lower band or condensation of supporting tissue (connective tissue and scattered muscle fibers). The lower collection, extending from the cervix uteri outward and upward to the pelvic wall near the "white line," is much the stronger of the two (Fig. 116). In fact, it is so important that it has been called the "ligamentum cardinale" of the uterus. The bladder supports in the upper plane are the utero-pubic fascial plane and the bands of tissue extending from the bladder to the uterus and to the broad ligaments along the ureters and to the pelvic wall and to the pubic bones. Both the uterine and vesical segments receive support, also, from the intact lower plane.

In addition to these two strong supporting planes, which directly resist intra-abdominal pressure, there is another factor which has much to do in maintaining the integrity of pelvic support. That factor is the deflecting mechanism, by which the force of intra-abdominal pressure is deflected from the weak area and distributed over the supporting planes. This mechanism depends upon the normal

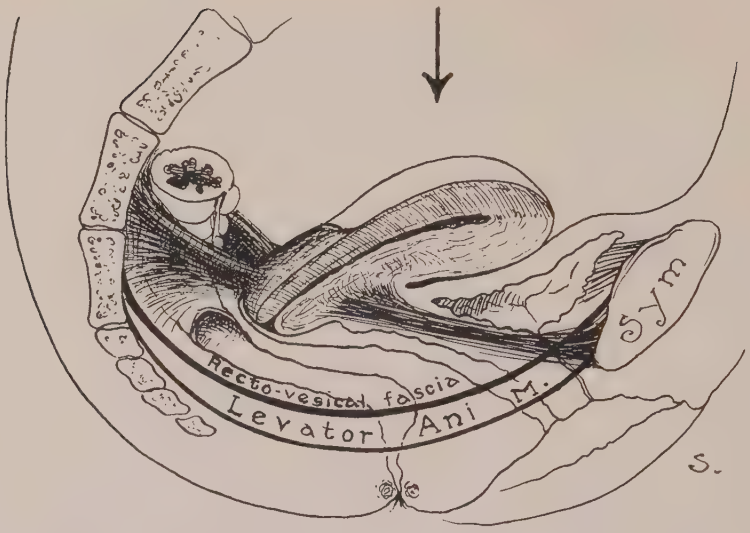


Fig. 115. The upper diaphragm and the lower diaphragm of the pelvis, showing the sling action antero-posteriorly. In the upper diaphragm, the antero-posterior sling is formed by the utero-sacral ligaments posteriorly and the utero-pubic fascial plane anteriorly. In the lower diaphragm, the antero-posterior sling, indicated here diagrammatically, is formed by the levator ani muscles and surrounding fasciæ, with supplementary muscles in front and behind.

This illustration indicates also the deflecting action of the corpus uteri, which receives the intra-abdominal pressure upon its posterior surface and distributes the same toward the margins of the supporting diaphragm.

Fig. 116. The upper diaphragm and the lower diaphragm of the pelvis, showing the sling action transversely. In the upper diaphragm the transverse sling is formed by the broad ligaments, and particularly by the strong supporting structures forming the lower portion of the broad ligaments. In the lower diaphragm, the transverse sling is formed by the levator ani muscles and surrounding fasciæ, shown here diagrammatically.

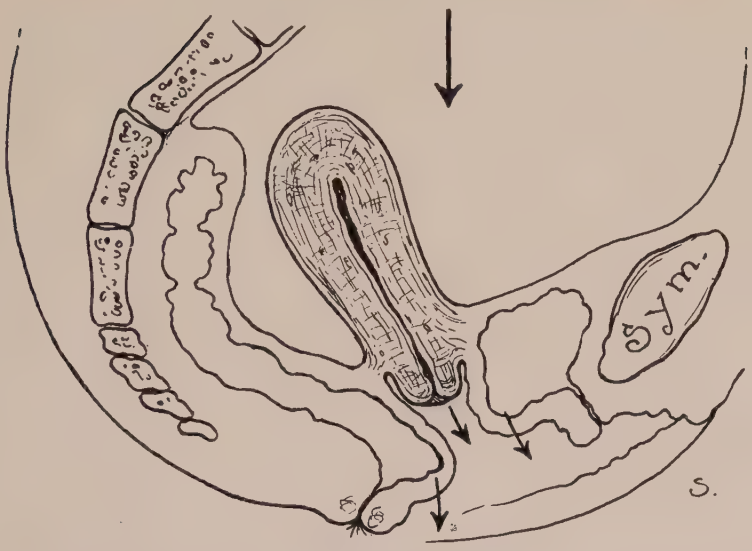


Fig. 117. Disarrangement of the deflecting mechanism by retrodisplacement of the corpus uteri, accompanied by relaxation of the pelvic floor. In the presence of such conditions, the development of prolapse is ordinarily only a question of time, for there is no adequate resistance to intra-abdominal pressure.

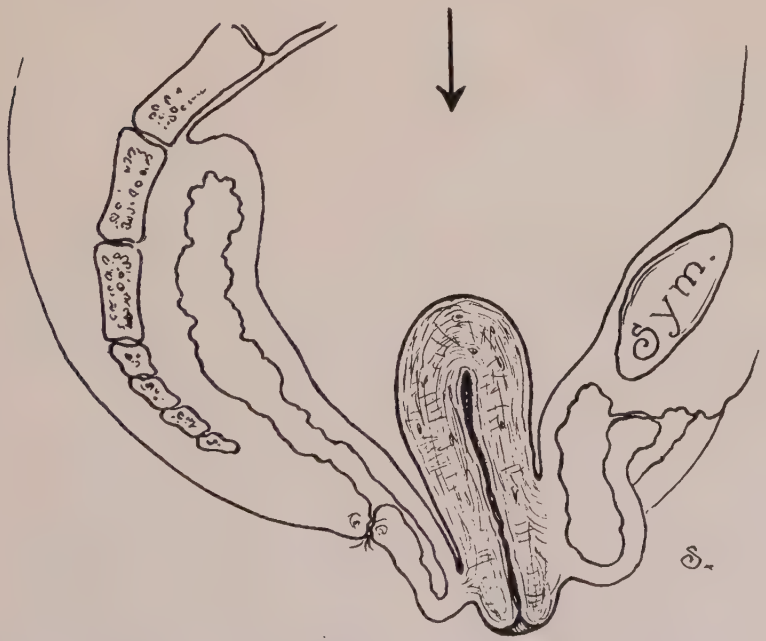


Fig. 118. Prolapse of uterus and bladder developed. The intra-abdominal pressure tends to push the structures farther and farther out of the pelvis.

anterior position of the corpus uteri. With the uterus in normal position, the intra-abdominal pressure is received on the posterior surface of the organ and distributed over a wide area of the supporting planes. Even though the vaginal opening has been enlarged and weakened considerably, it is protected from the abdominal pressure by the broad, firm deflecting surface just above. The greater the pressure from above, the more firmly is the protecting corpus uteri pressed over the opening. Again, as the corpus uteri is pressed downward and forward the cervix is pushed backward, putting the vaginal walls on the stretch anteroposteriorly and approximating the same, and thus still further providing against protrusion at the vaginal orifice. When the uterus is displaced backward, this deflecting mechanism is disarranged. This is one reason for the importance that attaches to backward displacement of the uterus. Aside from the symptoms caused by retrodisplacement and its complications, there is this disarrangement of the deflecting mechanism, which, in the childbearing woman, usually leads to serious loss of support sooner or later. With the pelvic floor torn and the utero-sacral ligaments stretched so that the cervix comes low and the corpus uteri goes back, the whole mechanism by which the intra-abdominal pressure is resisted by the two planes is disintegrated, and the uterus and bladder and anterior rectal wall are gradually forced down, as indicated in Figs. 117 and 118.

CLASSIFICATION OF OPERATIVE MEASURES.

The confusing multiplicity of operations for prolapse of the uterus necessitates a classification that will show at a glance the relation of each operation to the anatomical structures involved in the prolapse and also incidentally the general relation of each operation to the other operations employed in this condition.

The operative procedures for the relief of prolapse of the uterus and bladder may be arranged in two main groups. One group includes those operations which are applicable only in cases in which future pregnancy is eliminated, while the other group includes those operative measures which are not incompatible with subsequent childbearing. Under each main group there are vaginal operations and abdominal operations, as shown in the following table:

I. FUTURE PREGNANCY ELIMINATED.

A. VAGINAL OPERATIONS.

A. Utilization of Uterus to Cover Vaginal Opening (the weak place in the pelvic floor).

I. Vagino-fixation of Corpus Uteri (Mackenrodt, Duhrssen, Winter). The bladder is separated from the vagina and uterus, the peritoneum opened and sutures passed in a way to securely

fasten the vaginal wall and underlying fascia to the uterus halfway up its anterior surface. It is a step short of the interposition operation—the corpus uteri being fastened to the vaginal wall but not brought under the bladder. After the anterior vaginal wall is closed, the pelvic floor is repaired.

II. Subvesical Interposition of Corpus Uteri (Schauta, Wertheim, Watkins). The bladder is separated from the vaginal wall and uterus, the peritoneum opened and the corpus uteri brought down under the bladder and fastened there and the vaginal wall closed. The pelvic floor is then repaired, as in all these prolapse operations.

III. Vaginal Amputation of Corpus Uteri with Subvesical Interposition of Cervix (Landau). After the bladder is separated from the vaginal wall and uterus, the peritoneum opened and the corpus uteri brought down as in the regular interposition operation, the corpus uteri is amputated and the cervical stump is fastened securely well forward under the bladder, and the vaginal wall is closed.

IV. Subpubic Fixation of Cervix Uteri (Smith). After incision of vaginal wall and separation of bladder from vaginal wall and uterus, the anterior surface of the cervix uteri is sutured securely to the tissues beneath the pubic arch—thus preventing prolapse of the bladder or uterus.

B. Vaginal Removal of Uterus with Special Fixation of Pedicles.

V. Vaginal Hysterectomy with High Fixation of Vagina. After removal of the uterus the elongated pedicles are drawn down and the vaginal wall is sutured to them sufficiently high to take out the slack.

VI. Vaginal Hysterectomy with Low Fixation of Round Ligaments. After removal of the uterus the round ligaments and other pelvic pedicles are brought down and fastened beneath the pubic arch, thus forming a sling which supports the bladder, and the vaginal wall is closed (Mayo).

C. Closure of Vagina (Colpocleisis).

VII. Partial Closure of Vaginal Canal (LeFort). A denudation is made from the cervix to the vaginal entrance comprising one third of the width of the anterior vaginal wall, and a similar denudation is made on the posterior wall. These areas are then united by suture, giving a columnar union of the vaginal walls, which prevents prolapse and leaving a small canal on each side for escape of secretions.

VIII. Circular Constriction of Vaginal Entrance. A strong suture, usually of silver wire, is passed subcutaneously entirely around the vaginal entrance and drawn fairly taut, leaving just room enough for the escape of secretions.

IX. Obliteration of Vaginal Canal. The turned-out vaginal surfaces are completely denuded and then by circular sutures, preferably chromic catgut, the canal is obliterated. Beginning at the top, the successive circular sutures are placed about half an inch apart. This procedure has been used principally in cases of intractable prolapse of vagina and bladder subsequent to vaginal hysterectomy, in the days when ordinary vaginal hysterectomy was employed by some for prolapsus uteri.

D. Repair of Pelvic Floor. This is an essential measure in practically every case requiring operation for prolapse.

X. Regular Repair. The pelvic floor is opened, the levator ani muscles with the accompanying fasciæ are brought together in the median line by buried sutures, and the pelvic floor is closed.

XI. Special Plication for Rectocele. Before the deep levator sutures are passed, the bulging rectocele area is plicated by one or two rows of buried sutures.

B. ABDOMINAL OPERATIONS (Future Pregnancy Eliminated).

A. Fixation of Uterus to Abdominal Wall.

XII. Simple Ventro-fixation of Uterus. The peritoneum is pushed aside from the margin of the abdominal incision and the fundus is securely sutured to the abdominal wall in direct contact with the connective tissue. The fixation sutures may pass directly through the fundus uteri (Leopold) or through the utero-ovarian ligaments (Kelly) or through the round ligaments at their junction with the uterus (Olshausen) or through the fundus and ligaments (Vineberg).

XIII. Fixation to Wall by Fascial Strip. Schubert fastened up the prolapsed uterus by means of a fascial strip, separated from the abdominal wall. He operated through a transverse incision. Collins has recently proposed this as a new operation. Harris utilized the long tendon of the psoas parvus muscle for the same purpose. Freeman uses a strip of the fascia lata of thigh.

XIV. Implantation of Uterus in Abdominal Wall (Harris, Kocher, Eastman, Murphy). The corpus uteri is brought up into the abdominal wall and fastened to various layers there, by one of the four methods described under technique of operations.

B. Abdominal Removal of Uterus with Special Fixation of Pedicles.

XV. Supravaginal Hysterectomy with Fixation of Cervix to Pelvic Pedicles. The cervical stump is drawn up and the round ligament and other pedicles are sutured to it in a way to take up all slack and support the cervix and attached vaginal walls. Suturing the pedicles to the cervical stump is, of course, a step in every hysterectomy but in prolapse particular attention is given to taking up all slack in the pedicles.

XVI. Supravaginal Hysterectomy with Fixation of Cervix to Abdominal Wall. When the vagina is so unusually lax and long that fastening the cervix to the pedicles would not be sufficient to take up the slack in the vagina, then the cervical stump may be sutured directly to the aponeurotic layers of the abdominal wall.

XVII. Complete Hysterectomy with Fixation of Vagina to Pelvic Pedicles. The vaginal stump is drawn up and the pelvic pedicles are lapped over and sutured securely to it with chromic catgut in a way to hold it well up.

XVIII. Complete Hysterectomy with Fixation of Vagina to Abdominal Wall. The vaginal stump is closed and then drawn up and securely sutured with chromic catgut to the aponeurotic layer of the abdominal wall.

II. FUNCTION OF PREGNANCY PRESERVED.

A. Abdominal Operations.

XIX. Shortening of Utero-sacral Ligaments. Each utero-sacral ligament is isolated from its peritoneal covering and folded by sutures (Bovée), or each utero-sacral ligament is sutured to the posterior surface of the cervix uteri after scarification (Noble), or each utero-sacral ligament is implanted into the connective tissue of the cervical wall through a slit in the peritoneum (Smith).

XX. Shortening of Round Ligaments. Each round ligament is transplanted into the abdominal wall, either directly through the rectus area (Gilliam) or obliquely to eliminate free bands in the cavity (Crossen), or the round ligament of each side is drawn back through the broad ligament under the utero-ovarian ligament and fastened to the posterior surface of the corpus uteri (Webster, Baldy), or by sutures the slack portion of each round ligament is folded or reefed so as to take up all laxity (Mann, Dudley, Long).

XXI. Repair of Utero-pubic Fascial Plane from Above. The vesico-uterine fold of peritoneum is opened, the bladder separated from the uterus and utero-pubic fascial plane plicated by sutures which fold it transversely (Polk).

B. VAGINAL OPERATIONS (Function of Pregnancy Preserved).

A. Repair of Utero-pubic Fascial Plane from Below.

XXII. Plication. The anterior vaginal wall is incised and separated from the underlying fascial plane and bladder, and the connective tissue plane is then folded by superimposed rows of buried sutures running antero-posteriorly.

XXIII. Overlapping (Rawls). The vaginal wall and fascial plane are incised and separated from the bladder. The vaginal wall is then separated from the fascial plane on each side and then the two halves of the plane are overlapped by sutures.

B. Shortening of Round Ligaments.

XXIV. Fixation of Round Ligaments to Anterior Surface of Uterus (Goffe). The vagina is incised, the bladder separated from vagina and uterus, the peritoneum opened and the round ligaments brought down and sutured to the anterior surface of the uterus.

XXV. Fixation of Round Ligaments to Vaginal Wall (Wertheim). After the round ligaments are caught through the vaginal incision, each one is brought down and sutured to the vaginal wall and fascia.

C. Shortening of Broad Ligaments.

XXVI. Folding of Broad Ligaments in Front of Cervix (Alexandroff). After the incision of vaginal wall and separation of bladder from vagina and uterus and well out from broad ligaments, the strong connective tissue plane comprising the lower part of each broad ligament is isolated and then folded over the cervix and sutured there.

XXVII. Severing of Broad Ligaments and Approximation of Same in Front of Cervix (Hertzler, Dudley). After isolation of the strong connective band comprising the lower part of each broad ligament, the band is severed at the side of the uterus and the two are sutured securely together and to the front of the cervix.

D. Shortening of Utero-sacral Ligaments.

XXVIII. Severing of Utero-sacral Ligaments and Approximation of Same in Front of Cervix (Jellett). Through a circular incision about the cervix the utero-sacral ligament of each side is isolated and severed from the uterus and the two are then approximated in front of the cervix.

XXIX. Drawing of Utero-sacral Ligaments Through Broad Ligaments (Wagner, Martin). Through a vaginal incision the broad ligament of each side is isolated. A forceps introduced through it is made to grasp the utero-sacral ligament, which is then drawn forward and sutured in front of the cervix.

E. Amputation of Cervix Uteri.

XXX. Amputation of Glandular Area. The inner portion of the cervix, comprising the glandular area, is excised, leaving the outer portion as a flap to be closed over the raw surface.

XXXI. Regular Amputation of Cervix. Where there is marked hypertrophic elongation of the cervix, the excess is removed by the regular wedge-shaped amputation, leaving an outer and inner flap to be approximated by suture.

F. Repair of Pelvic Floor. As before stated, repair of the pelvic floor is required in practically all cases of operation for prolapse, whether the patient is in the childbearing period or past the menopause and whether the main operative procedure is abdominal or vaginal.

III. SPECIAL COMPLICATIONS

A. Retro-uterine Hernia.

XXXII. Abdominal Obliteration of Posterior Culdesac. In addition to the abdominal measures for uterine prolapse, the culdesac of Douglas is scarified or otherwise roughened and obliterated by sutures.

XXXIII. Vaginal Obliteration of Posterior Culdesac. In conjunction with the vaginal operative measures for prolapse, the culdesac of Douglas is opened and obliterated by sutures.

B. Prolapse of Rectum and Sigmoid.

XXXIV. Colopexy. Through the abdominal incision the prolapsed bowel is raised and attached securely in the iliac fossa or along the ilio-abdominal angle or, if preferred, to the anterior abdominal wall.

TECHNIQUE OF OPERATIONS.

For description of technique, the operative measures for prolapse of the uterus and bladder will be taken up according to the above classification into groups and subgroups.

FUTURE PREGNANCY ELIMINATED.

A. VAGINAL OPERATIONS.

I. Vagino-fixation of Uterus.

(MACKENRODT, DÜHRSSEN, WINTER.)

This is efficient in mild cases, where the prolapse of uterus and bladder is not severe. It is a step short of the interposition operation. It elevates the bladder, holds the corpus uteri forward and, with good repair of the pelvic floor, answers the purpose in cases where the broad ligaments and utero-sacral ligaments are not greatly lengthened. It is applicable only in cases in which there will be no pregnancy. The technique has already been detailed under retrodisplacement (Figs. 100 and 101).

II. Subvesical Interposition of Corpus Uteri.

(WATKINS, SCHAUTA, WERTHEIM.)

1. *The bladder is separated from the anterior vaginal wall.* This may be accomplished by median incision from the urethra to the cervix and then separation of the bladder from the center outward on each side, as indicated in Figs. 119 and 120. Attention to certain details aids materially in the work. The separation should take place between the bladder and the utero-pubic fascia, so that the fascia remains attached to the vaginal wall instead of to the bladder, thus giving a stronger support under the interposed uterus. There are two lines of cleavage here—one, not very apparent in the median line, between the vaginal wall and fascia and the other, more evident, between the fascia and the bladder wall. The latter cleavage area is the one to be sought. It is most easily identified in the posterior half of the incision. When the incision has reached the proper depth, lateral blunt dissection with the knife handle will aid in identifying the cleavage plane. In Fig. 119 this lateral separation has been carried far enough to identify the bladder wall. The bladder separation should be carried far enough laterally to permit the excess of vaginal wall to be trimmed away at the close of the operation.

If preferred, the bladder may be separated from the vaginal wall by making a small incision (longitudinal or transverse) just in front of the cervix and then working forward with gauze covered finger, dividing the vaginal wall after the bladder has been raised from it. Some operators separate the bladder from the vaginal wall by blunt scissors thrust between the two, but there is more danger of injuring the bladder by this method.

2. *The bladder is separated from the uterus.* Laterally the bladder is easily pushed off the cervix but in the median line it is usually held by some connective tissue fibers which must be divided with scissors or knife. This group of fibers has been designated the utero-vesical ligament and is indicated by the arrow in Fig. 120. It is pulled up for identification, as in Fig. 120, and divided near the cervix. Then the bladder is easily separated from the uterus by gauze dissection, as indicated in Fig. 121, up to the vesico-uterine fold (Fig. 122). The lateral dissection of the bladder from the broad ligament should be only sufficient to give room for bringing down the fundus uteri. As the uterus is not to be removed,

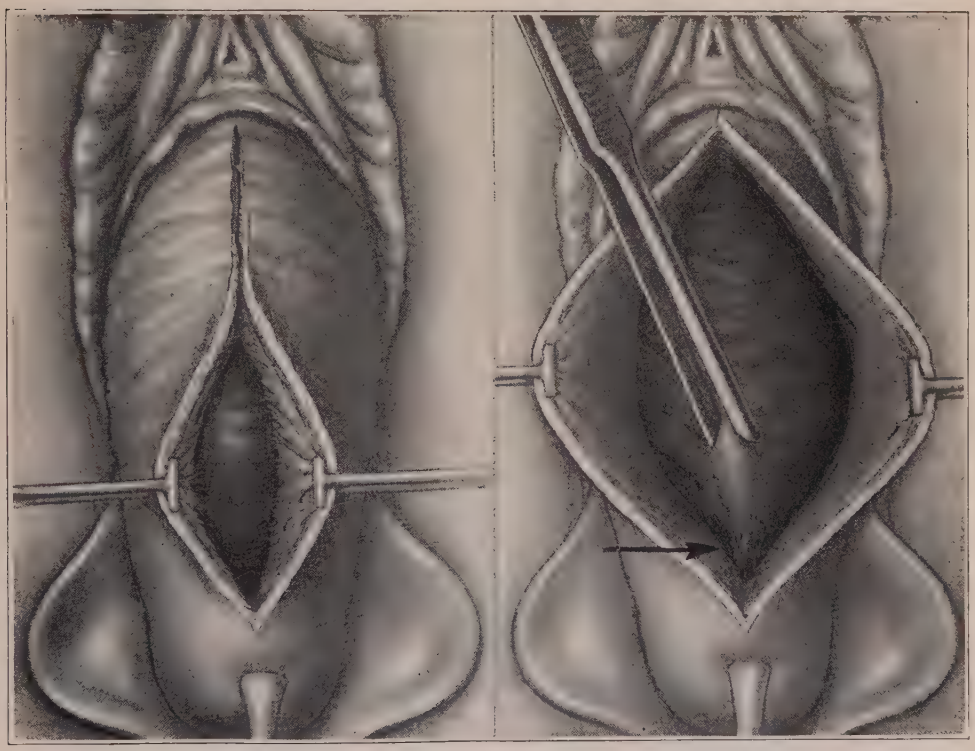


Fig. 119. Fig. 120.

Fig. 119. Subvesical interposition of corpus uteri. Incision of the anterior vaginal wall. Both the vaginal wall and attached utero-pubic fascia have been divided in the posterior part of the incision, exposing the bladder wall in the bottom of the wound.

Fig. 120. The vaginal wall and fascia separated from the bladder well out to each side. The arrow indicates the group of fibers called the uterovesical ligament, which must be divided before the bladder can be freely pushed off by gauze dissection.

there is no necessity for baring the broad ligaments, and any unnecessary dissection is a disadvantage in that it increases the oozing and prolongs the operation.

3. The vesico-uterine peritoneal fold is opened (Figs. 121 and 124). Difficulty is sometimes experienced in identifying this fold. It may be recognized by

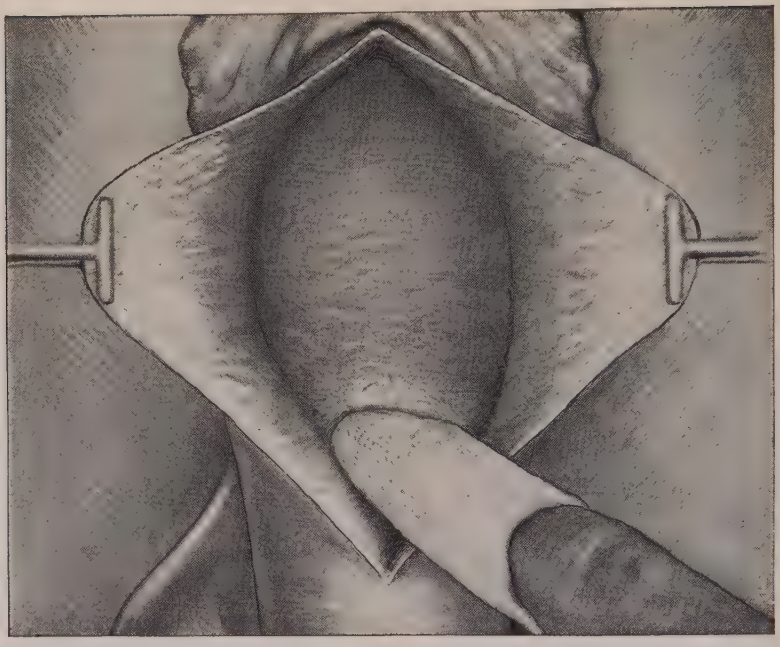


Fig. 121. The separation of the bladder from the vaginal wall-fascia completed. Beginning the separation of the bladder from the uterus. The gauze-covered finger is rolling off the bladder from the cervix.

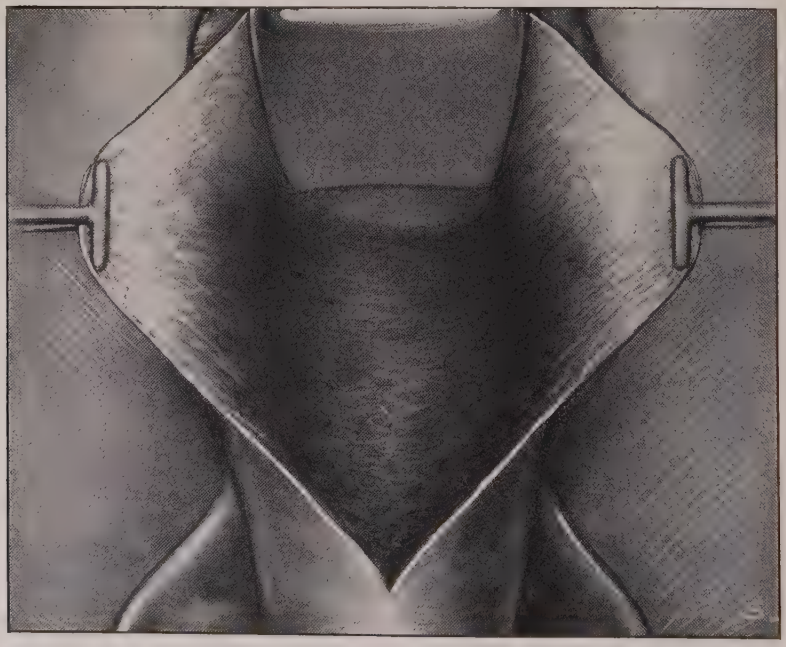


Fig. 122. The separation of the bladder from the uterus completed. The vesico-uterine peritoneal pouch is exposed.

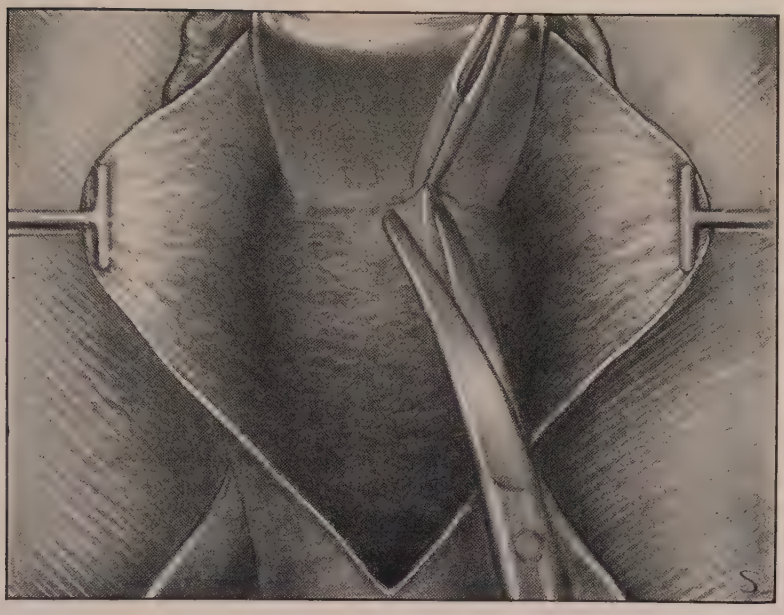


Fig. 123. Picking up the peritoneum, preparatory to cutting through it. This peritoneal fold may be identified by touch, as explained in the text.

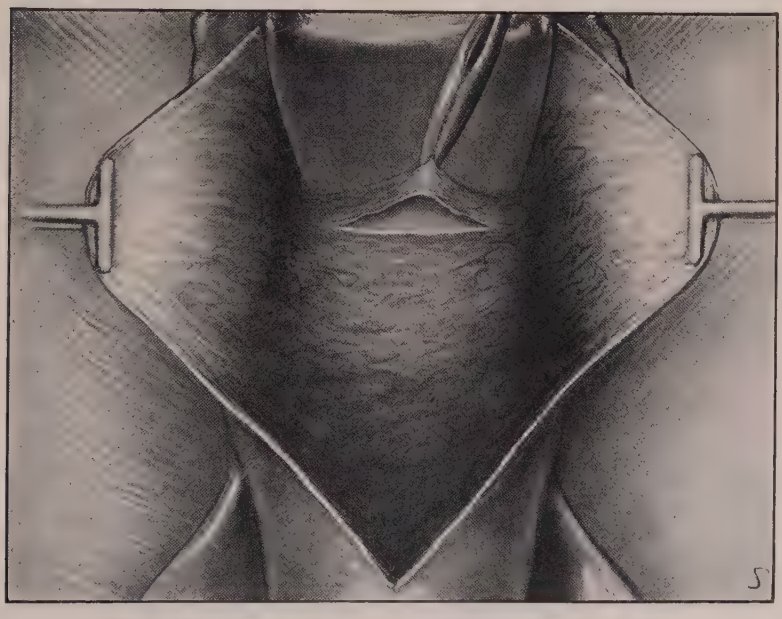


Fig. 124. The peritoneal pouch opened.

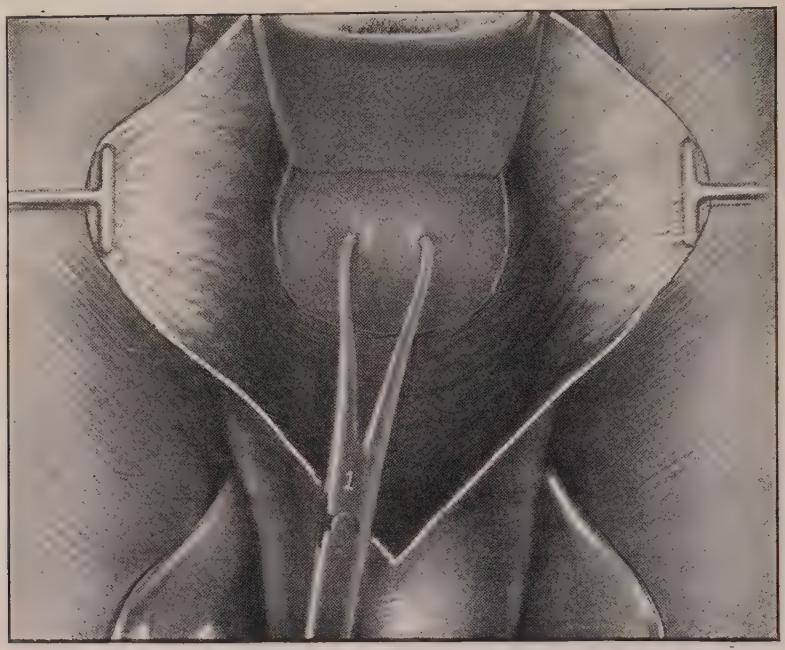


Fig. 125. Bringing down the fundus uteri. The first forceps applied and being drawn downward. Each forceps is numbered as applied, that its change in position may be followed as the fundus uteri is gradually brought down.

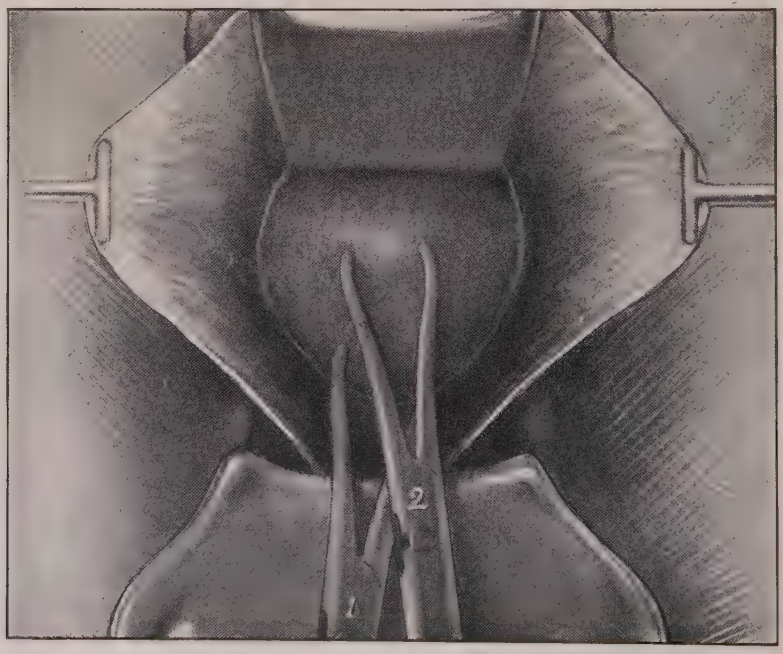


Fig. 126. Bringing down the fundus uteri. The second forceps applied and being drawn downward. The cervix has been pushed back into the vagina.

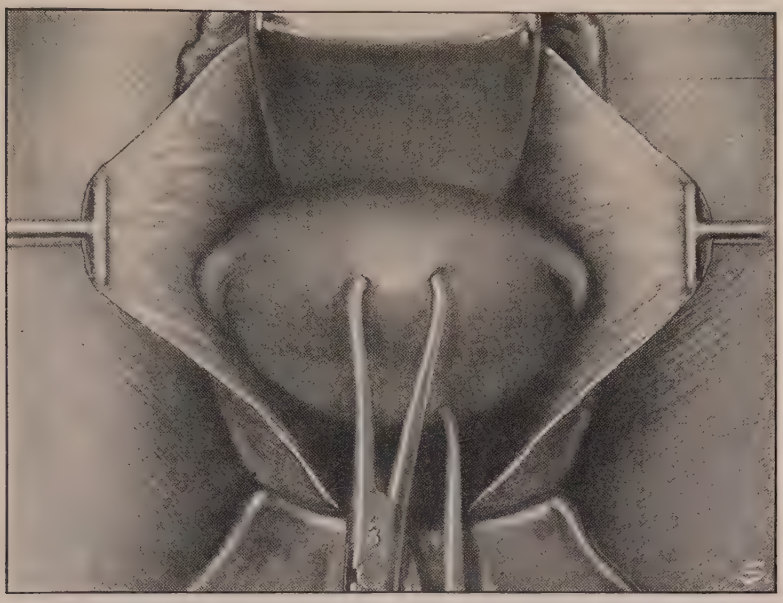


Fig. 127. Bringing down the fundus uteri. The third forceps applied and drawn downward, bringing the fundus outside.

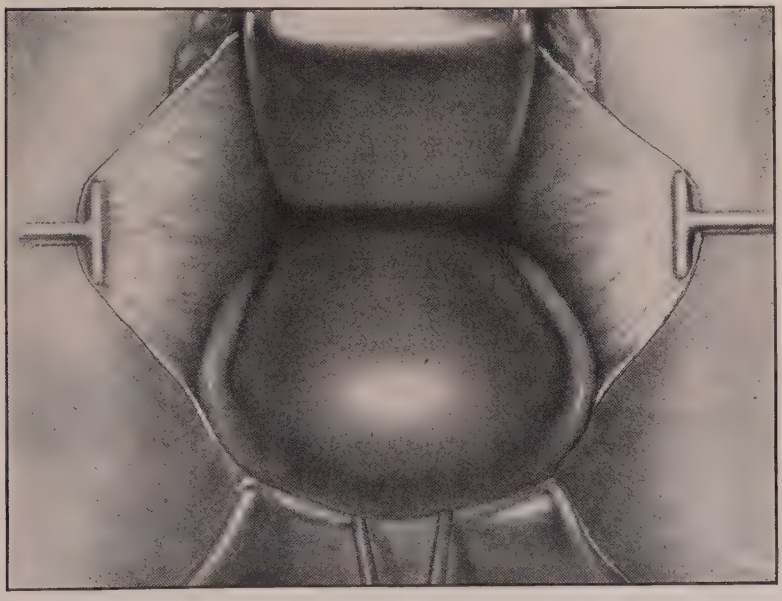


Fig. 128. The fundus uteri brought still further outside and pushed down to allow examination of the adnexa.

sight by a difference in color, as indicated in Fig. 122. Usually, however, it must be recognized by touch. With the bladder separated to some distance above the fold, and a finger pressing the fold against the uterus and moving about, the operator can appreciate that one peritoneal surface is moving on the other. The peritoneum is then caught with a forceps (Fig. 123) and divided with the scissors (Fig. 124). In some cases a small amount of peritoneal fluid escapes, giving a

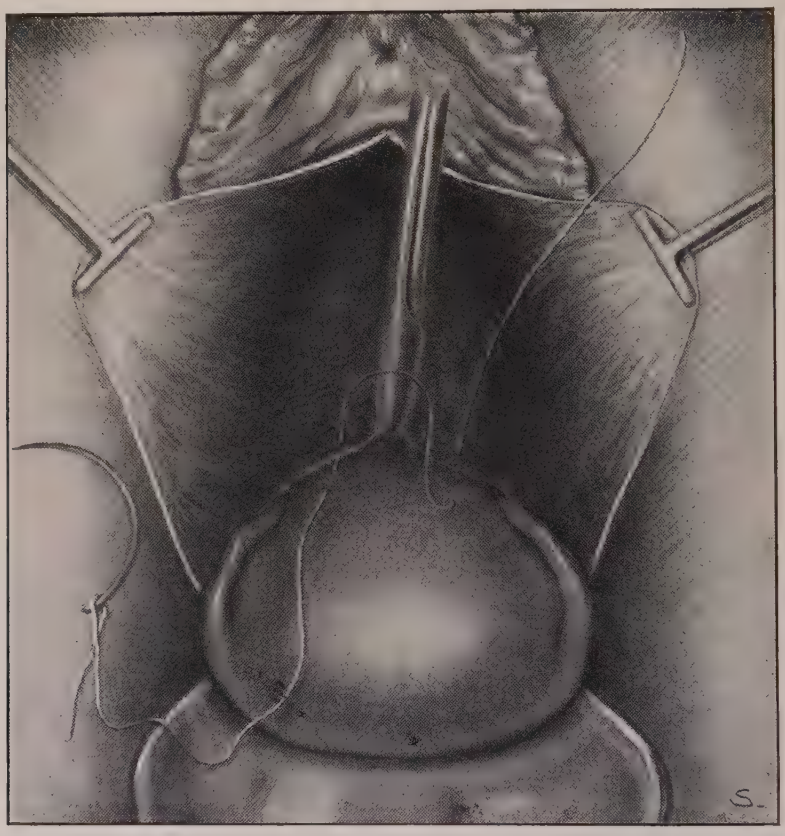


Fig. 129. Fastening the vesical peritoneum to the posterior surface of the uterus at about the level of the internal os.

momentary impression that the bladder has been opened. Occasionally the peritoneum is opened simply by the dissection up to it, a small spot of smooth peritoneal surface showing at once.

A troublesome condition is that in which the line of dissection extends between the peritoneal pouch and the uterus. The dissection is carried higher and higher, but still no peritoneal pouch appears. When this condition is suspected, the examining fingers are to be turned toward the bladder, when the peritoneal pouch, if present, may be recognized by identifying the two peritoneal surfaces moving on each other. This difficulty is caused, usually, by dissecting too close

to the uterus, in the anxiety to avoid wounding the bladder. At the lower part of the bladder-attachment to the cervix, it is well to keep close to the cervix, carefully rolling off all loose tissue with the bladder wall. After the bladder wall is well started and the loose connective tissue area between the bladder and cervix is clearly defined, then the bladder may be simply pushed off the cervix, following the line of least resistance. This nearly always carries the dissection be-

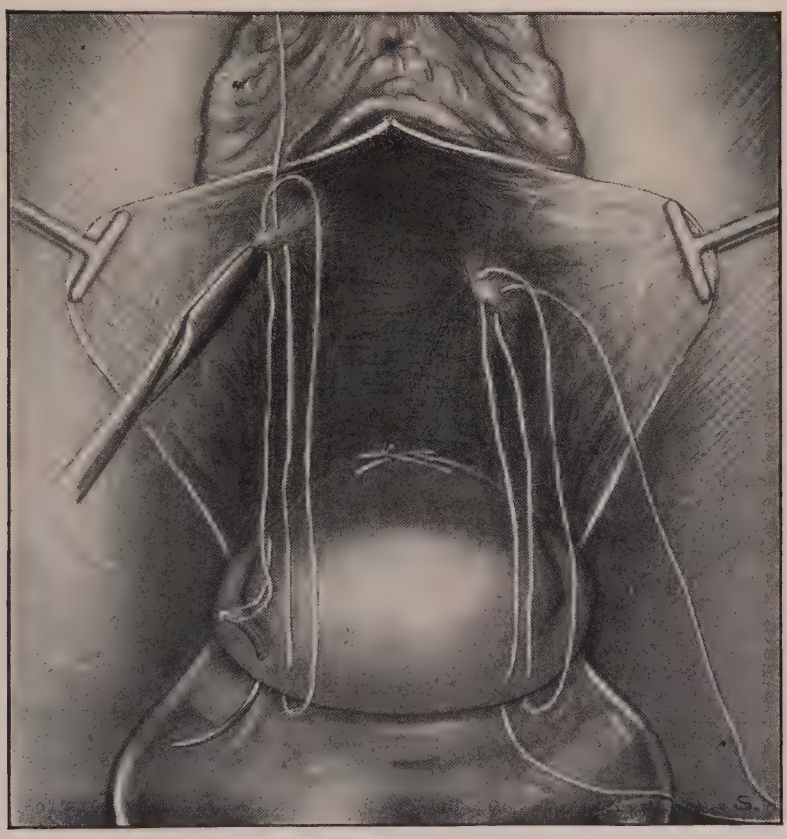


Fig. 130. The special fixation-sutures that fasten the fundus uteri to tissues that have firm attachment to the pubic arch.

tween the bladder-wall and the vesical peritoneum, and the peritoneal pouch may be recognized as soon as reached.

4. The fundus uteri is brought out by tenaculum-forceps, placed one above the other as more of the uterus is brought into view (Figs. 125 to 128). The delivery of the fundus is facilitated by pushing the cervix back in the pelvis.

It is at this stage that the condition of the uterus is definitely determined. There may be fibroid nodules that require myomectomy or hysterectomy.

Hysterectomy may be advisable on account of enlargement of the uterus from chronic metritis or on account of damage from deep cervical tears or on account

of a hemorrhagic tendency in the uterus or on account of its being sclerotic and hypersensitive. If the uterus is in good condition, except enlarged, simple reduction in size by excision of a portion as explained later (Figs. 141 to 146) may be advisable.

The adnexa, also, are examined and, if pathological, treated as indicated. In patients past the menopause, the adnexa are usually atrophic and require no special attention.

5. The edge of the vesical peritoneum is sutured across the posterior surface of the uterus at about the level of the internal os (Fig. 129). This practically shuts off the peritoneal cavity, making the operative area extraperitoneal.

6. The fundus uteri is then fastened in its new location between the bladder and vaginal wall. With operators generally, the simple sewing over of the vaginal

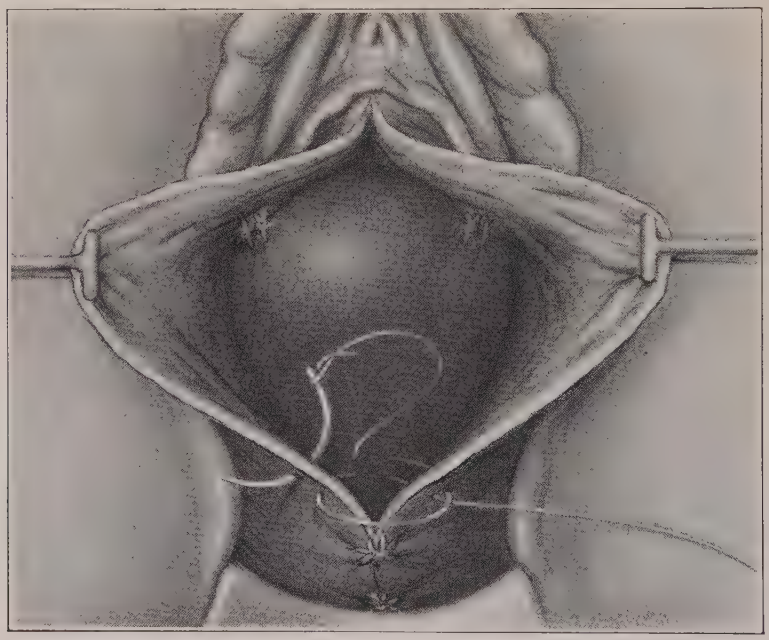


Fig. 131. The special fixation-sutures tied. Beginning to close over the vaginal flaps.

wall is depended on to hold the uterus in position. This gives a good result in most cases, but there have been some recurrences. They come about in two ways. The uterus has prolapsed, fundus-end first. In other instances the fundus has slipped out from under the bladder up into its old position, thus permitting the cervix to come low and again prolapse.

In order to fasten the fundus uteri more securely and prevent recurrence, the author has for several years used two special buried sutures, as indicated in Fig. 130. These sutures fasten the fundus to tissues which have a dependable attachment to the pubic arch. These tissues are identified by traction with forceps (Fig. 130). Different tissues are caught and pulled upon until some are

found which are firmly attached to the pubic arch, and then the special sutures are passed (Fig. 130). These sutures are entirely buried when the vaginal flaps are brought over, as shown in Figs. 131 and 132. They fasten the fundus uteri to tissues that resist both downward and upward displacement.

7. The vaginal wall is then sutured over the fundus uteri. If the vaginal wall is very lax, the excess should be trimmed off so that when sutured it will form a good side-to-side sling for the corpus uteri to rest upon. The suture closing the vaginal wound should take hold of the uterus, as indicated in Fig. 131.

By this operation the corpus uteri is utilized to cover the weak place in the pelvic floor and to support the bladder. A thorough repair of the relaxed pelvic floor (see Chapter III) is of course a necessary part of this operation. Fig. 133 shows the relation of the parts after completion of the operation.

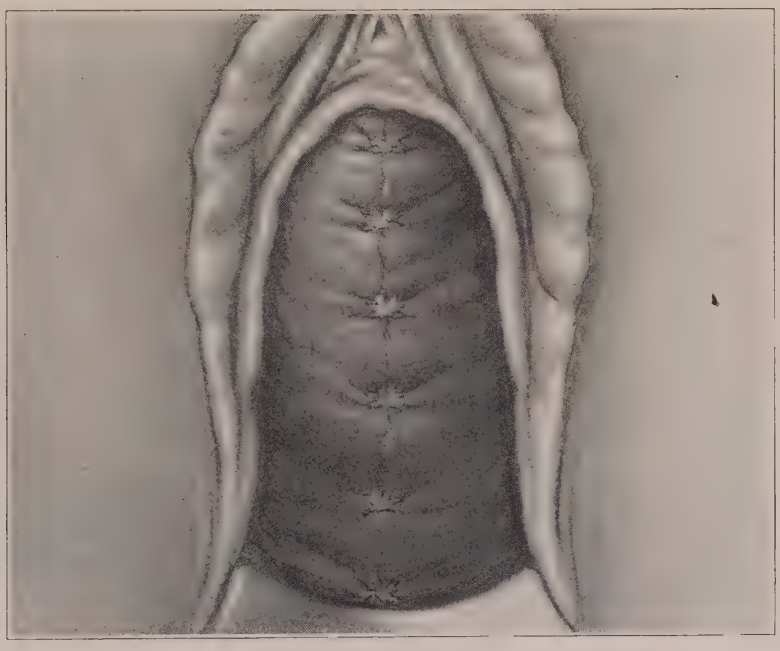


Fig. 132. The suturing completed.

There are **special steps** for taking care of special conditions, as follows:

a. Amputation of the cervix uteri. In cases in which the cervix is enlarged, lacerated, chronically inflamed or the seat of extensive cystic disease, the cervix should be amputated. The details are shown in Figs. 134 and 135. Only the excess of cervical tissue should be removed, the line of excision being placed at least half an inch below the internal os. A too extensive amputation causes unnecessary bleeding and delay, and leaves the uterus in less satisfactory condition for utilization in support. It is an advantage to have the inner end of the uterus well back in the pelvis. A rather long uterus is better for impinging on the perineal support than one rendered short by a too extensive amputation of the cervix.

b. Shortening of utero-sacral ligaments. In cases where the cervix comes very low, it may be advisable to shorten the utero-sacral ligaments. This is especially important when the uterus is small, to insure a good posterior position of the cervix. The technique is shown in Figs. 136 and 137. After the fundus is turned out, the utero-sacral ligaments are brought into view. The sacral portion of the ligament of one side is made tense with a forceps (Fig. 136) and a suture passed through it and then through the posterior surface of the cervix. The other side is then treated in the same way (Fig. 137) and then the sutures are tied. Care should be exercised to include not only peritoneum (false ligament), but also a portion of the strong ligamentous tissue beneath.

Another method of shortening the utero-sacral ligaments in connection with

Fig. 133. Sectional view, showing the relations of the uterus after completion of the operation. Pelvic floor repair, indicated by the lined area, is an essential part of the operation.

the interposition operation, is to draw them through the broad ligaments and fasten them together in front of the cervix uteri. After the vesico-uterine peritoneal pouch has been opened and the corpus uteri brought out, a pressure forceps is thrust through the lower part of the broad ligament on one side. This is made to grasp the utero-sacral ligament and bring it forward through the broad ligament close beside the cervix. The other side is treated in the same way and the two utero-sacral ligaments are fastened to each other and to the front of the cervix. Wagner cuts each utero-sacral ligament from its uterine attachment before drawing it through the broad ligament. Martin simply draws the ligaments through uncut, the folds being fastened securely to the front of the cervix.

c. Sterilization. This is necessary when the operation is employed in patients

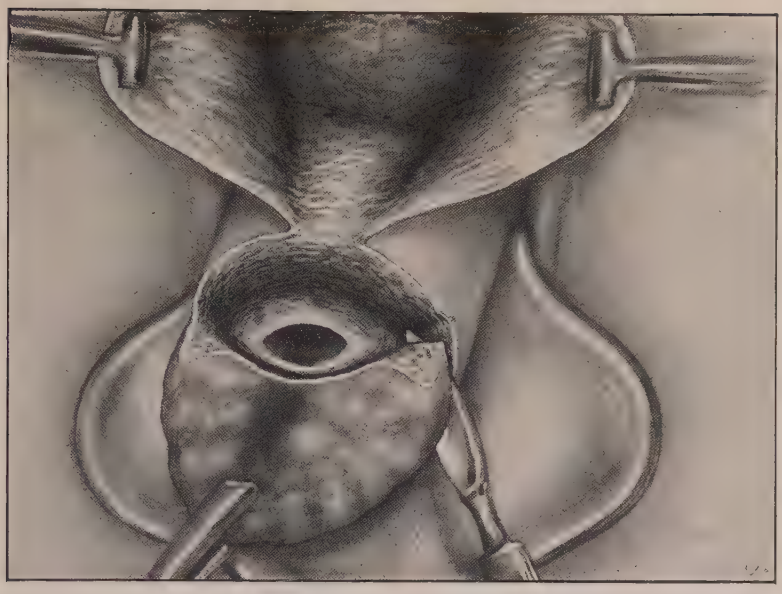


Fig. 134. Amputation of the infiltrated and cystic portion of an hypertrophied cervix. The diseased anterior lip has been removed, and the posterior lip is being excised.

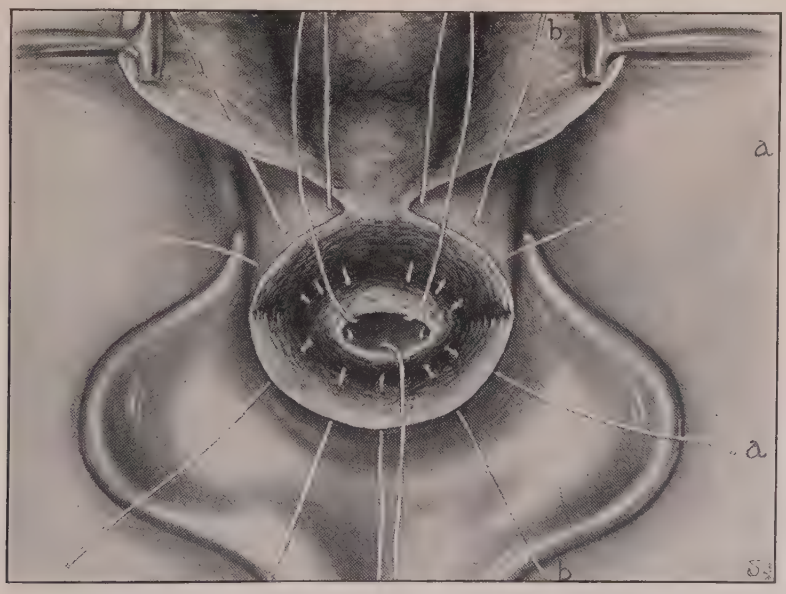


Fig. 135. Amputation of the cervix. Excision of tissue completed, and the sutures introduced.

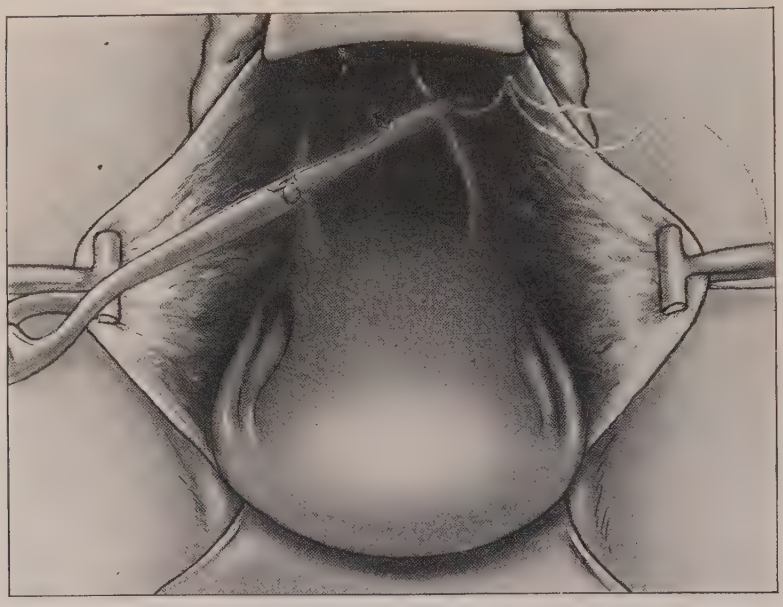


Fig. 136. Shortening the utero-sacral ligaments through the anterior vaginal incision. The left ligament held in a forceps while a suture is introduced near its posterior end.

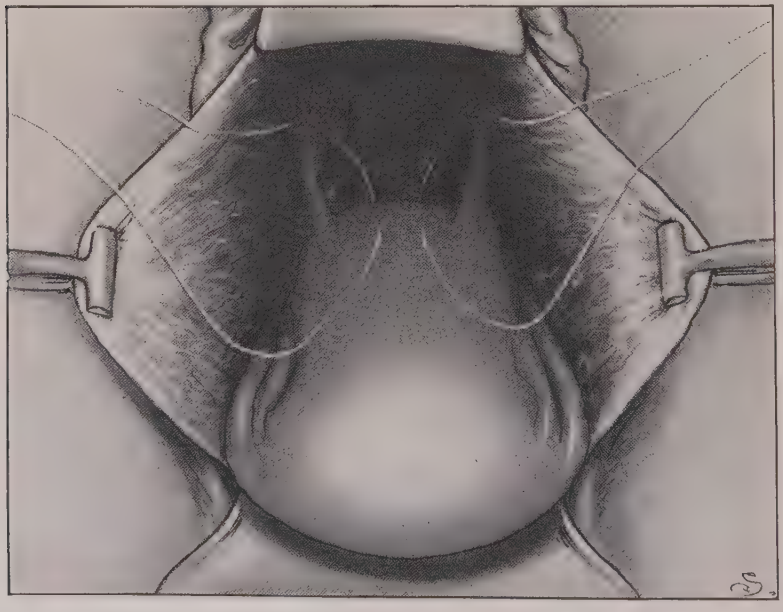


Fig. 137. Shortening the utero-sacral ligaments. Both sutures introduced and ready for tying.

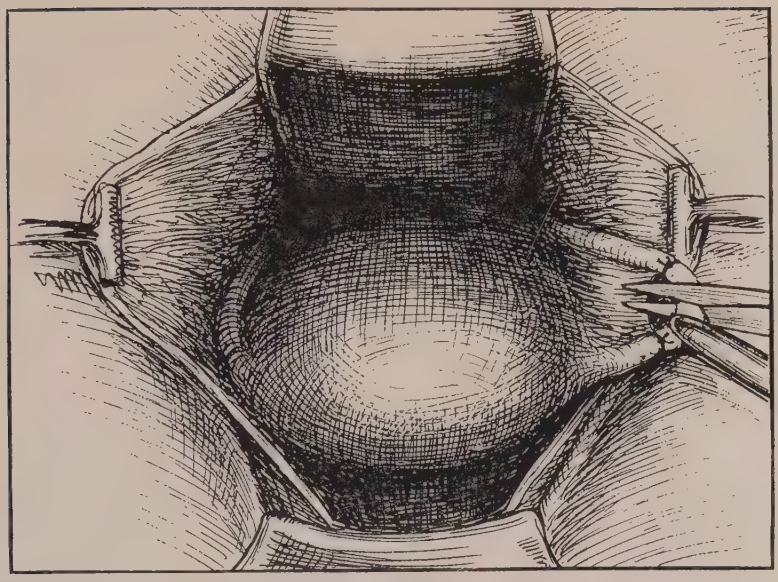


Fig. 138. Sterilization by the division of each tube and burying the proximal end in the connective tissue. Dividing the left Fallopian tube after ligation. The ligatures may be of catgut, if preferred, for the effectiveness of the operation does not depend on permanent closure of the tube by ligature, but on the complete burying of the proximal end in the scar-tissue at the vesico-vaginal angle.

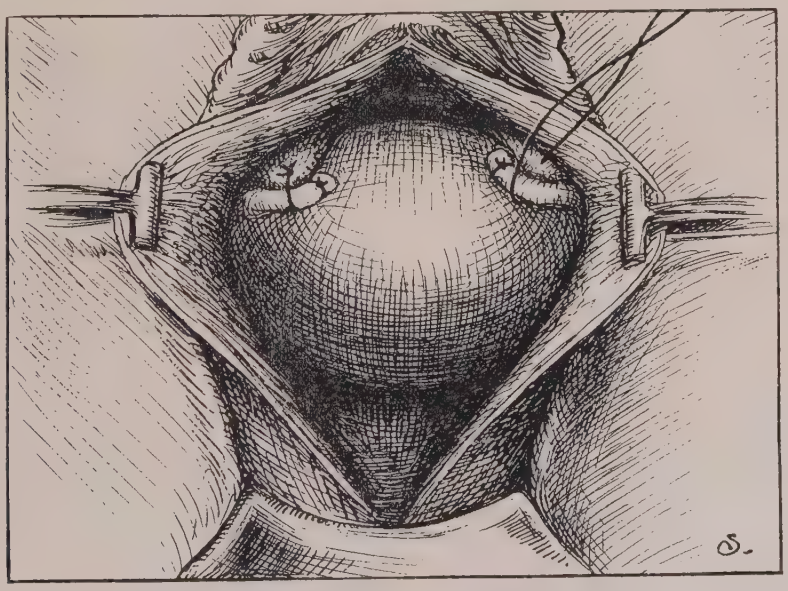


Fig. 139. Proximal end of each tube turned forward and caught in the special fixation-suture of that side. This location of the proximal end of each tube causes it to become buried in the scar-tissue between the vaginal wall and the fundus uteri.

still in the childbearing period. After division of the tube (Fig. 138) the proximal stump should be effectually isolated from the distal portion and from the peritoneal cavity. Under the circumstances, this may be easily effected by curving the proximal stump forward on the fundus (Fig. 139), where it becomes buried in the scar-tissue at the vesico-vaginal angle.

If preferred, the interstitial portion of the tube may be excised. The vessels at the tubal origin are caught with a forceps and a small portion of the uterine horn is excised with the end of the tube, as shown in Fig. 140.

d. Excision of part of corpus uteri. In those cases in which the uterus is too large but still the uterine tissue is in condition to be used, the organ may be reduced to approximately normal size by excision of a wedge-shaped piece as shown in Figs. 141 and 142. Bleeding is prevented by a forceps at each horn,

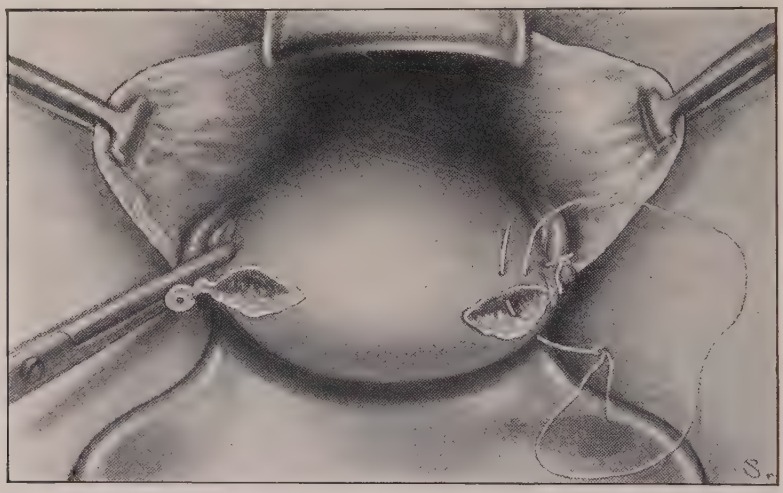


Fig. 140. Sterilization by excision of the interstitial portion of each tube. Interstitial portion of each tube excised. Closing the wound on the left side.

clamping the vessels, as in Fig. 143. These forceps are convenient, also, for holding the uterus during the excision. Oozing in the uterine wound is controlled by one or two rows of sutures closing the wound (Fig. 142).

Another method for reducing the size of the uterus, is to split the anterior surface from the external os to the fundus (Fig. 143), excise enough of the corpus to reduce the size as desired (Figs. 143 and 144), trim out the mucosa of the corpus and cervix (Figs. 144 and 145) and close the raw surface with sutures (Figs. 145 and 146) to prevent oozing. During the excision the bleeding is controlled by a forceps on each side of the fundus as indicated in Fig. 143. After the excision each forceps is replaced by a ligature, and the closing sutures are so placed (Figs. 145 and 146) as to control any oozing present. The reduced uterus is then fastened beneath the bladder to give the desired support.

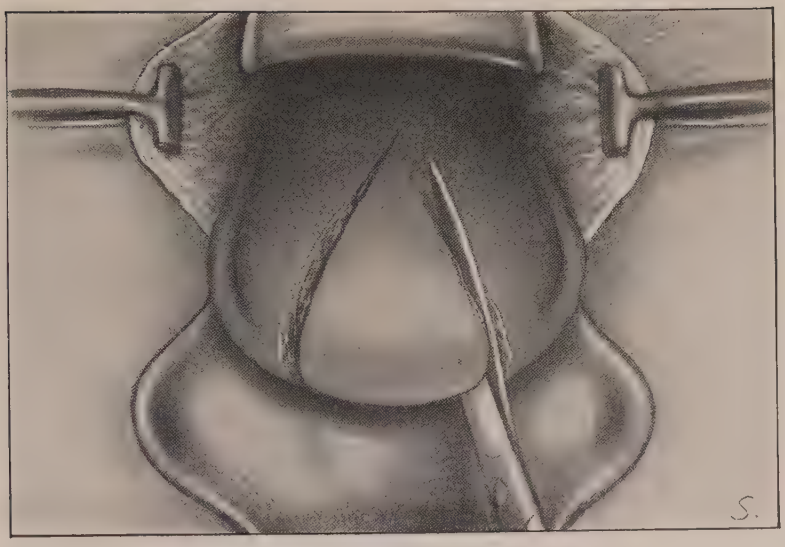


Fig. 141. Excision of a wedge-shaped portion of the corpus uteri to reduce the size.

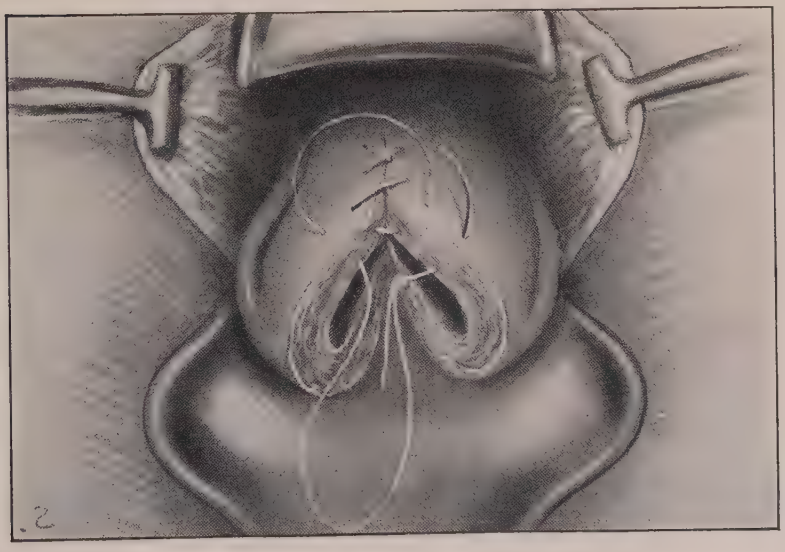


Fig. 142. Closing the wedge-shaped wound.

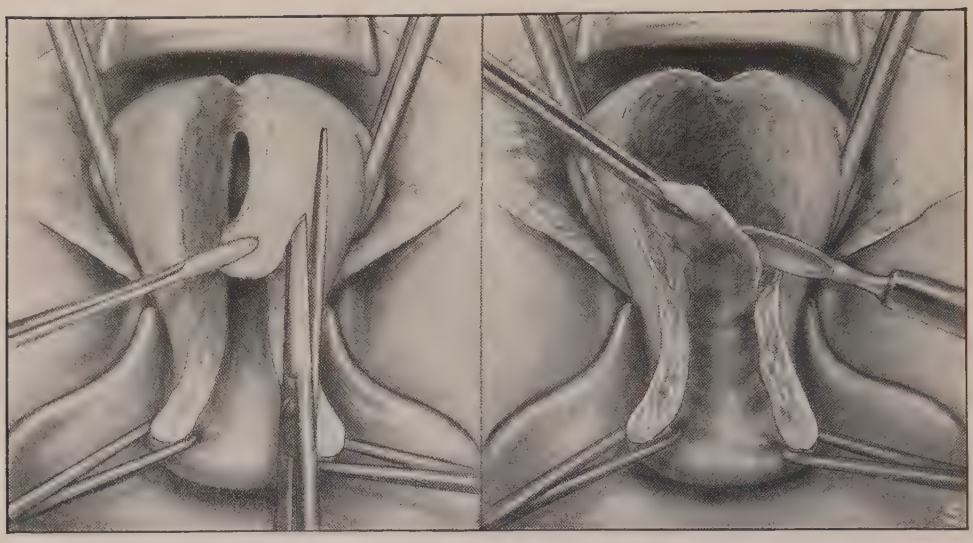


Fig. 143. Fig. 144.

Fig. 143. Another method of reducing the size of the uterus. It is divided along the whole anterior surface. Then enough tissue is removed, as here indicated, to reduce the organ to the size best suited for support.

Fig. 144. Excising the mucosa. The mucosa of both corpus and cervix is entirely removed.

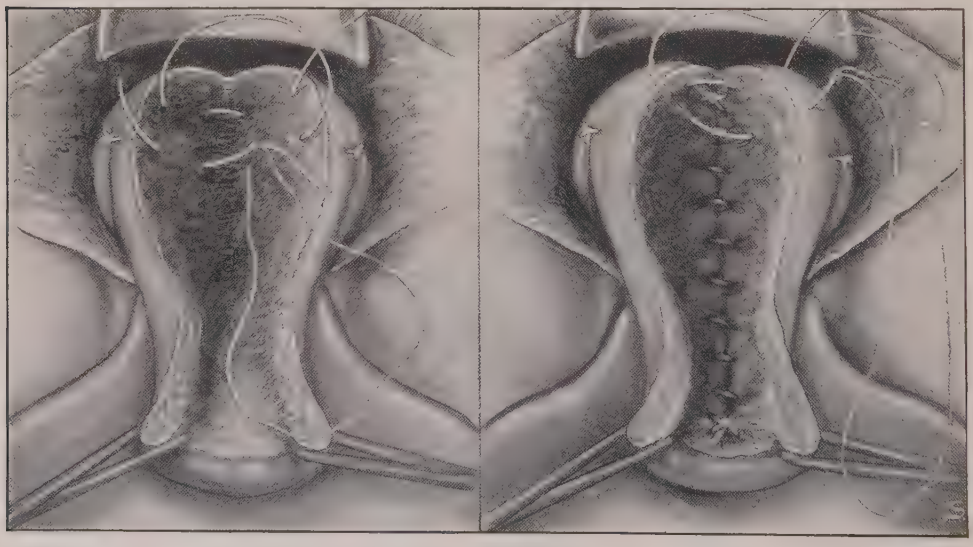


Fig. 145. Fig. 146.

Fig. 145. Closing the wound. Beginning the first row of buried sutures.

Fig. 146. The last row of sutures, which completely closes the raw area.

III. Vaginal Amputation of Corpus Uteri with Subvesical Interposition of Cervix (Landau).

This is applicable in cases where the corpus uteri must be removed, but the cervix is normal and may be preserved.

1. The corpus uteri is turned out as in the interposition operation and then a needle carrying a strong suture (40-day catgut or silkworm-gut, as preferred) is entered in the trimmed vaginal flap under the urethra, then passed through the vesical peritoneum, then through the posterior surface of the cervix uteri, then through the vesical peritoneum again and then out through the vaginal flap on the other side. Fig. 147 shows the course of this suture. When this suture is tied, the cervix is drawn forward under the base of the bladder, as indicated in Fig. 148, and the opening in the peritoneal cavity is thus closed.

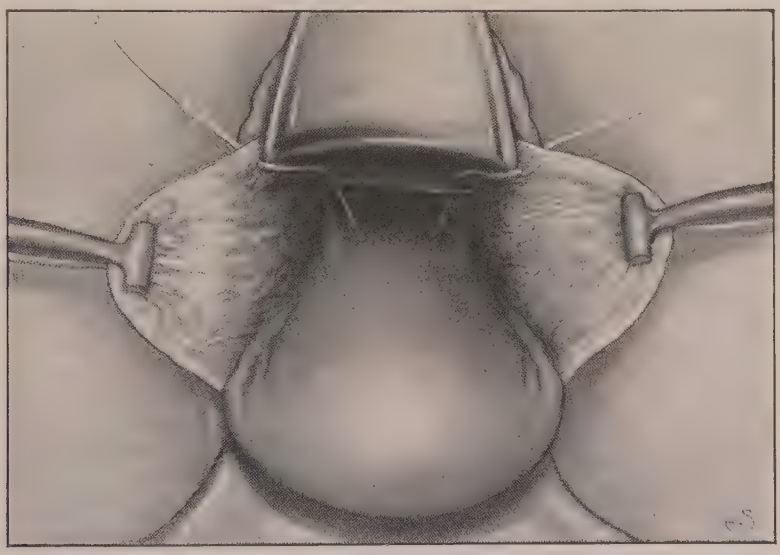


Fig. 147. Partial hysterectomy with low fixation of the cervix. The first suture is here shown. It passes through the vaginal wall, vesical peritoneum and posterior wall of cervix uteri at the level of the utero-sacral ligaments.

2. The tissues lateral to the corpus uteri are then clamped and divided, as shown in Fig. 148, and the body of the uterus is amputated at the dotted line (Fig. 148).

3. The round ligaments and adnexal pedicles are then fastened to the cervical stump (Fig. 149) and the trimmed vaginal wall is closed over, as shown in Figs. 150 and 151.

This operation is much the same as the regular interposition operation, except that the corpus uteri is removed and the cervix is used instead to support the bladder (Fig. 151). Care should be taken to preserve enough of the uterus (all the cervix and, if necessary, the adjacent portion of the corpus) to

give the required support and also to avoid shortening of the vagina. The preserved cervix should be long enough so that, with the upper end fastened under the neck of the bladder, the other end, carrying the vaginal vault, will extend far enough back (Fig. 151) to avoid undue shortening of the vagina.

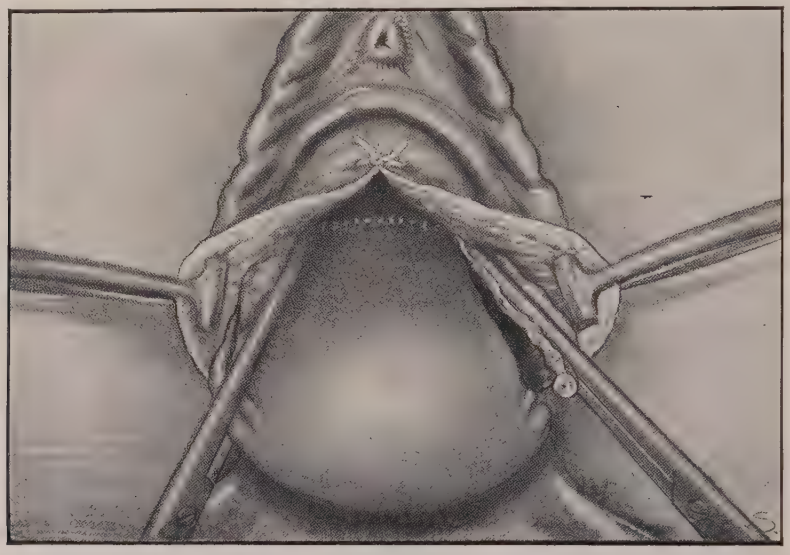


Fig. 148. Freeing the corpus uteri, ready for excision at the dotted line.

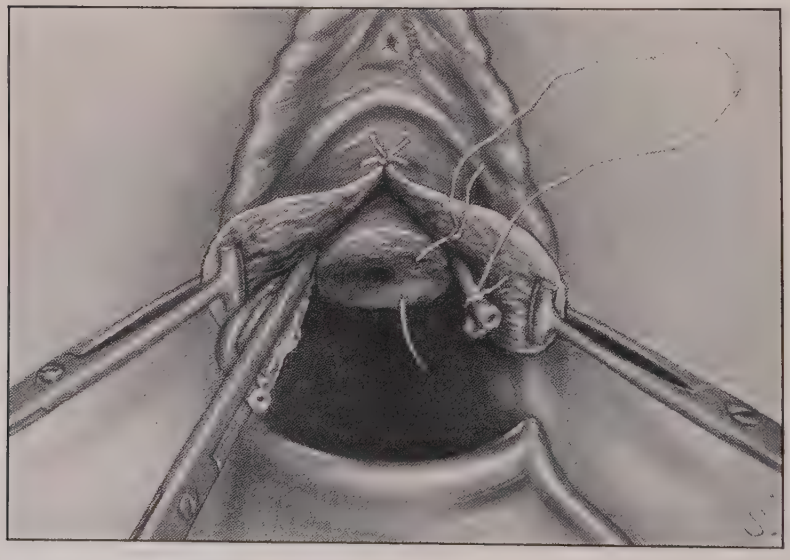


Fig. 149. The corpus uteri excised. Fastening the cervical stump and the pedicles well forward under the base of the bladder.

IV. Simple Subpubic Fixation of the Cervix Uteri (Smith).

Through a vaginal incision the bladder is separated from the vaginal wall and the uterus. The posterior end of the incision is then widened sufficiently to bare the anterior lip of the cervix. This bared area of the cervix is then sutured securely to the firm tissues under the pubic arch, exposed by extending

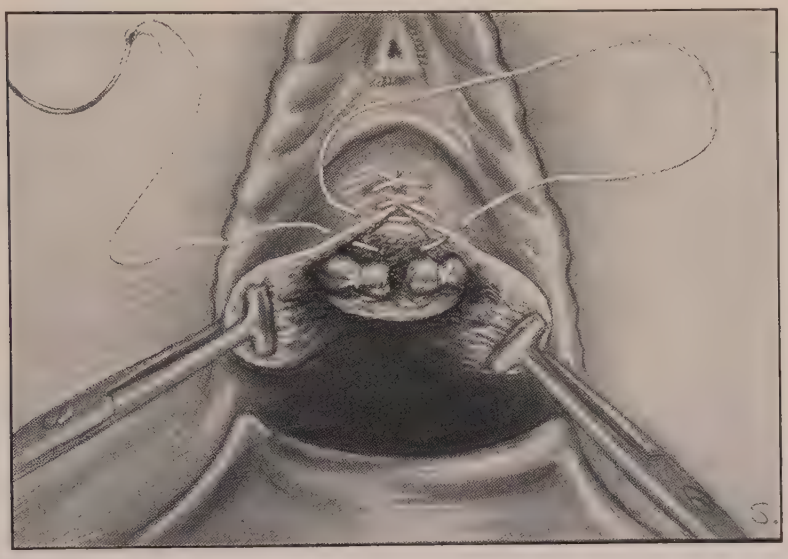


Fig. 150. Closing the vaginal incision. Any excess of vaginal wall should be trimmed away.

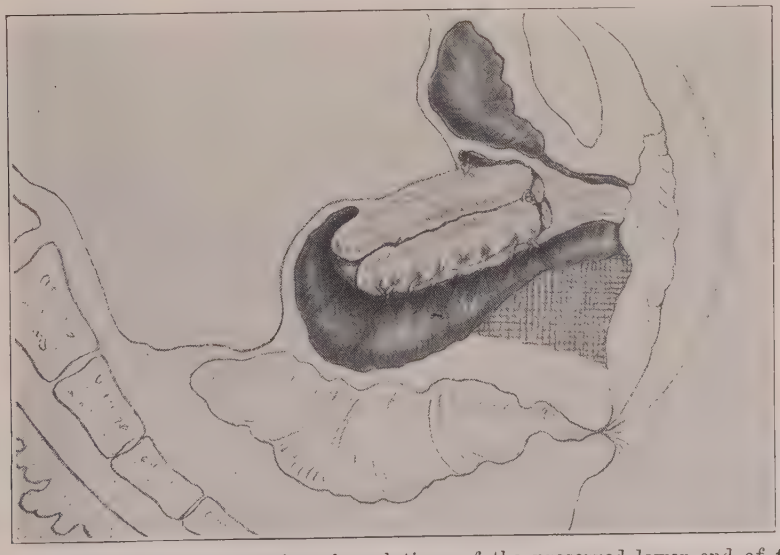


Fig. 151. Sectional view, showing the relations of the preserved lower end of the uterus after completion of the operation. The preserved uterine stump should be long enough to prevent undue shortening of the vagina, as explained in the text.

the forward end of the incision; that is, to overcome the troublesome cystocele the uterus is sutured in moderate prolapse, to serve as a lid to the vaginal opening. There would seem to be a strong probability of further

Fig. 152. Fig. 153.

Fig. 152. High fixation of the vagina to the pelvic pedicles. One of the fixation sutures passed through the pedicles and through the vaginal wall.

Fig. 153. The suture tied, drawing the top of the vagina up to the pelvic pedicles.

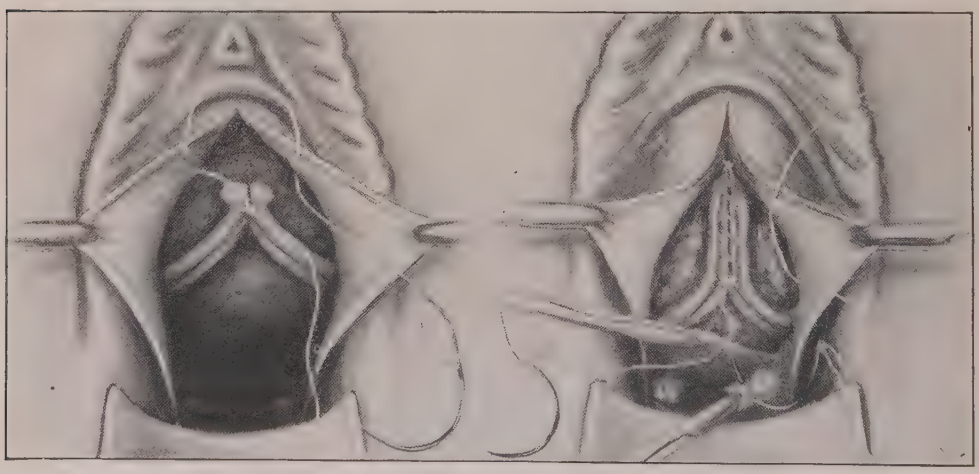


Fig. 154. Fig. 155.

Fig. 154. Low fixation of the pelvic pedicles. Fastening the round ligaments well forward under the base of the bladder.

Fig. 155. The round ligaments sutured together for a considerable distance. The same suture catches the vesical peritoneum. Another suture is being passed through the left broad-ligament pedicle, to fasten it forward as indicated.

prolapse, but Smith (Boston M. and S. Journal, 1917, Vol. 176) has employed the operation in sixteen cases and states that "in every case the results have been all that could be desired."

V. Vaginal Hysterectomy with High Fixation of Vagina.

After removal of the uterus, the pelvic pedicles are brought down into the vagina and the end of the vagina is fastened high on the pedicles, as indicated in Figs. 152 and 153. This pulls the vagina up, and later the contraction of scar tissue tends to draw it up still more. In cases where the vagina is long and lax, the upper part may be trimmed off sufficiently to produce the desired result. If catgut is used, it should be well chromicised. The author prefers 40-day catgut No. 1 or No. 2. Catgut not sufficiently chromicised gives way before firm

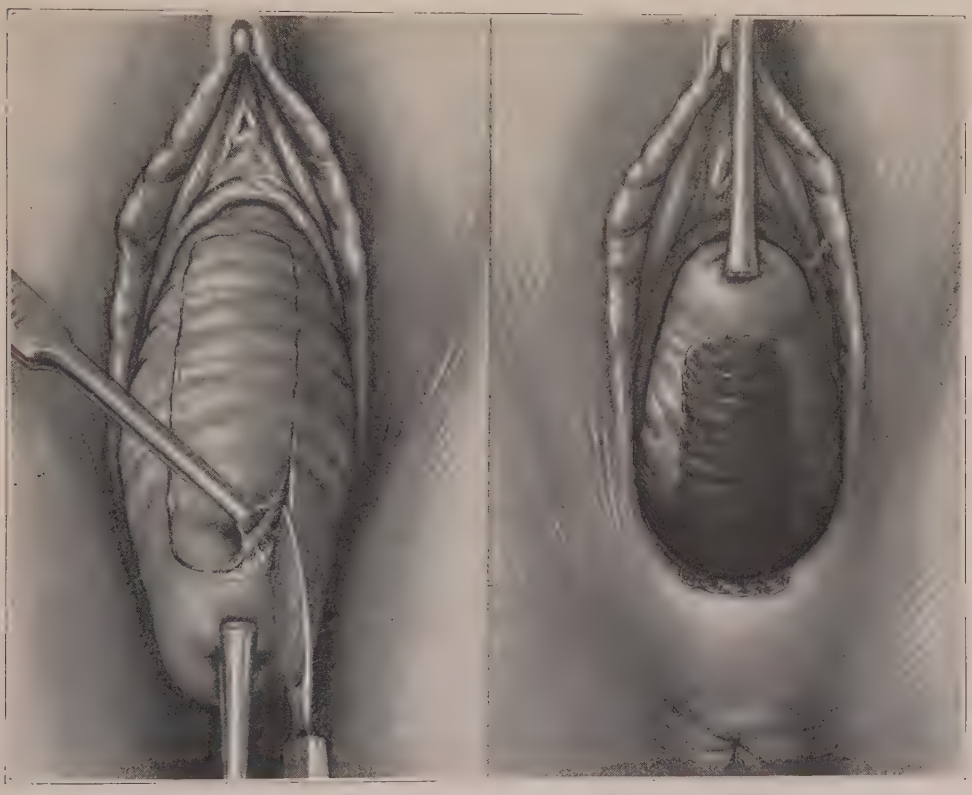


Fig. 156. Fig. 157.

Fig 156. Partial closure of vaginal canal (Le Fort technique). Beginning the denudation of the anterior vaginal wall. The rectangular area to be denuded has been outlined by incision.

Fig. 157. The denudation on the posterior vaginal wall completed.

healing has occurred and permits the structures to separate more or less. Silk and linen of course last well, but are likely to leave a suppurating sinus, which persists until the ligatures are removed or until they cut themselves out.

VI. Vaginal Hysterectomy with Low Fixation of Round Ligaments.

In this operation the bladder is separated from the vaginal wall and pushed up as in the interposition operation and, after removal of the uterus, the round-

ligament stumps are brought down and sutured to the vaginal wall as far forward as possible under the base of the bladder. At the Mayo clinic, where this operation was developed and is extensively used, it is termed "vagino-pelvic fixation operation."

1. The anterior vaginal wall is divided by an antero-posterior incision, which extends from near the meatus urinarius backward to the cervix. The bladder is separated from the vaginal wall and then from the uterus and broad ligaments and is pushed up out of the way.

2. The uterus is then removed. During the hysterectomy the round ligaments and other pedicles are kept separated so that they may be drawn down and utilized for support, as explained later.

3. After removal of the uterus, the excess of vaginal wall at the sides of the incision is trimmed away. The round-ligament pedicles are ligated and then brought down under the bladder and sutured to the vaginal wall just back of the meatus, as indicated in Fig. 154. The two round ligaments are then sutured together, as shown in Fig. 155, giving a line of support along the center of the bladder. This has been referred to as "hanging the bladder on a clothes-line." When this approximation of the round ligaments has been carried as far as desired, the vesical peritoneum may be brought down and fastened with the same suture (Fig. 155). However, the author prefers to later fasten the peritoneal flap posteriorly, as shown in the combination vaginal operation for prolapse (Fig. 214). The ovarian pedicles also may be simply tied together later (Fig. 215) instead of being brought forward as indicated in Fig. 155.

4. The utero-sacral ligaments are shortened (Figs. 213 and 214) to hold the vaginal vault back in the pelvis, the peritoneal pouch is closed (Fig. 214) and the vaginal vault sutured (Fig. 215).

5. The vaginal incision is then closed by interrupted sutures. If desired, this may be a simple approximation closure, the excess of vaginal wall being trimmed off. A stronger and better supporting closure, however, is made by the overlapping operation (Figs. 216 and 217).

6. Repair of pelvic floor. A strong repair of the relaxed pelvic floor is of course an essential part of any operation for prolapsus uteri.

In closing the vaginal vault, care should be taken to include in the sutures all bleeding tissue of the vaginal wall. Again, the fixation of the pedicles and closure of the vaginal wound should be so conducted as to preserve the proper length of the vagina. This is accomplished by giving particular attention to two maneuvers—first the fastening of the shortened utero-sacral ligaments to the vaginal vault (Fig. 214) thus drawing the vault upward and, second, closing the vaginal wound with interrupted sutures (Fig. 217), and in such a way that the shortening and constriction is from side to side instead of antero-posteriorly. If these points are overlooked the whole vaginal

wound, including the vaginal vault, may be drawn forward under the pubic arch, causing troublesome shortening of the vagina.

VII. Partial Closure of Vaginal Canal (Partial Colpocleisis).

In some cases it may be advisable to keep the uterus in the pelvis by sewing the vaginal walls together. This is usually effected by the Le Fort technique. A rectangular oblong area of mucosa is removed from the anterior

Fig. 158. Fig. 159.

Fig. 158. Suturing the denuded areas, to give a broad firm line of union between the anterior and posterior vaginal walls.

Fig. 159. Repairing the relaxed floor, before uniting the anterior portions of the denuded surfaces.

vaginal wall (Fig. 156) and a corresponding area from the posterior wall (Fig. 157). These areas, which are opposite each other and extend from near the cervix to the vaginal entrance (Fig. 158), are securely approximated by sutures, beginning at the upper end (Figs. 158 and 159). This closes the vagina, except for a small channel on each side along which uterine discharge may escape. During the operation the relaxed pelvic floor should of course be repaired (Fig. 159). This operation is particularly indicated in aged

patients who are not good operative risks and where coitus need not be considered. If necessary it may be carried out under local infiltration anesthesia.

VIII. Circular Constriction of Vaginal Entrance (Venot).

A silver wire suture is passed under the mucosa inside the vaginal entrance as shown in Fig. 160. It is tied with sufficient tension to constrict the vaginal orifice (Fig. 161), so that the uterus and vaginal walls can no longer escape.

IX. Obliteration of Vaginal Canal.

In very exceptional cases it may be advisable to overcome the prolapse by closing the vagina entirely. If the uterus is removed or is so atrophied that there has been no discharge, the vagina may be obliterated. The turned out vagina wall is denuded by removal of all the mucosa. Circular sutures of chromic catgut (or silk or silver wire if preferred) are passed around the vagina and tied, beginning at the top. The circular sutures should be about half an inch (1.2 cm. apart. As the upper sutures are tied, that portion of the vagina is pushed up into the pelvis. As more sutures are tied, more of the

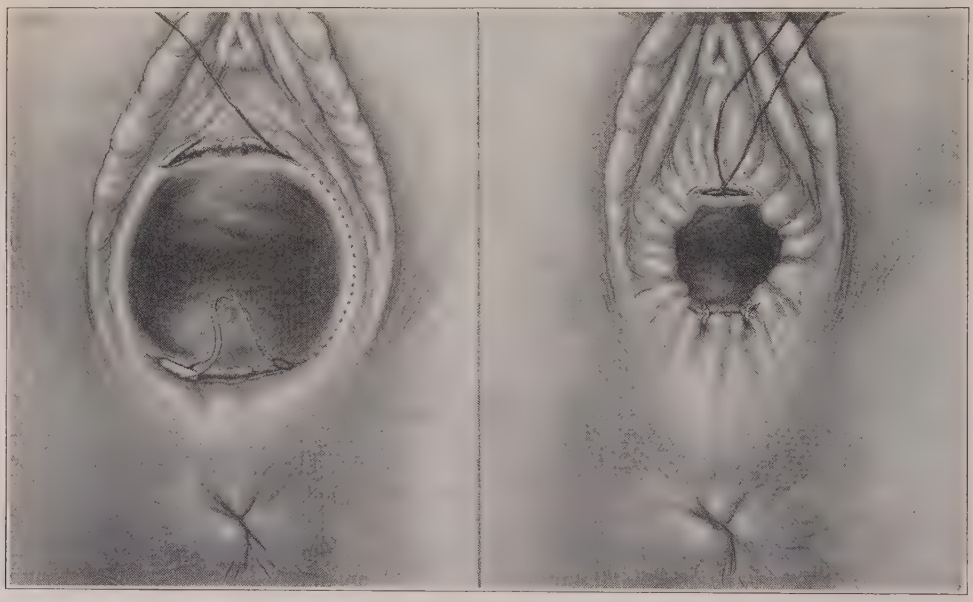


Fig. 160. Fig. 161.

Fig. 160. Circular Constriction of the Vaginal Entrance (Venot). The constricting silver wire suture has been passed on the patient's left side, and the needle is in place on the right side.

Fig. 161. The constricting suture has been passed and twisted so as to narrow the vaginal opening to the required extent, and is ready to be cut and the ends buried. The small posterior slit has already been closed by sutures.

closed vagina is pushed within the pelvis. As the pelvic floor is reached a strong repair of this by buried sutures should be made separately, and then the closure of the vagina completed to the outside.

X. Regular Repair of Pelvic Floor.

The technique of repair of the pelvic floor is given in Chapter IV (see page 196).

XI. Rectocele Operation.

The special plication sutures required in repair of the pelvic floor and extensive rectocele are given in Chapter IV.

FUTURE PREGNANCY ELIMINATED.

B. ABDOMINAL OPERATIONS.

XII. Ventro-fixation of Uterus.

The details of ordinary ventro-fixation are described and illustrated in the preceding chapter (see Figs. 47 to 51). Two special features have been employed in cases of severe prolapse.

a. Rector, through the abdominal incision, separated the bladder freely from its cervical attachment, raised it to near the top of the uterus and fastened it there to the denuded uterine surface. The fundus uteri was then fixed to the abdominal wall.

b. Rushmore, in some troublesome cases, first did the interposition operation and then opened the abdomen and brought the cervix up and fastened its posterior surface securely to the anterior abdominal wall. In executing this operation it may be necessary to separate the posterior vaginal wall from the rectum for some distance down from the cervix, in order to prevent troublesome tension on the rectum.

XIII. Fixation of Uterus to Abdominal Wall by Fascial Strip.

Schubert, in six cases, fastened up the prolapsed uterus by means of a fascial strip separated from the abdominal wall. He operated through a transverse abdominal incision. In the cases operated upon, no provision had to be made for future pregnancy, but he proposes a modification suitable in the childbearing period.

Harris, in two cases, used the long tendon of the psoas parvus muscle of each side, to hold the cervix uteri upward and backward. Through an incision in the peritoneum over it, as it lies on the psoas magnus, the tendon of the psoas parvus is traced to its insertion in the pectineal eminence, where it is divided. By blunt dissection, the end of the tendon is then drawn under the iliac vessels. The tendon of the other side is brought into the pelvis in a similar way. Then they are both sutured securely to the posterior surface of the cervix uteri, drawing it upward and backward as though the utero-sacral ligaments had been shortened. This operation is proposed as a substitute for abdominal shortening of the utero-sacral ligaments in cases where the latter are too much attenuated for satisfactory use.

XIV. Implantation of Uterus in Abdominal Wall.

This differs from ventro-fixation in that the uterus instead of being fixed to the wall is implanted in the wall. There are several methods of implantation.

a. The method of Harris, which he described under the term "abdominal

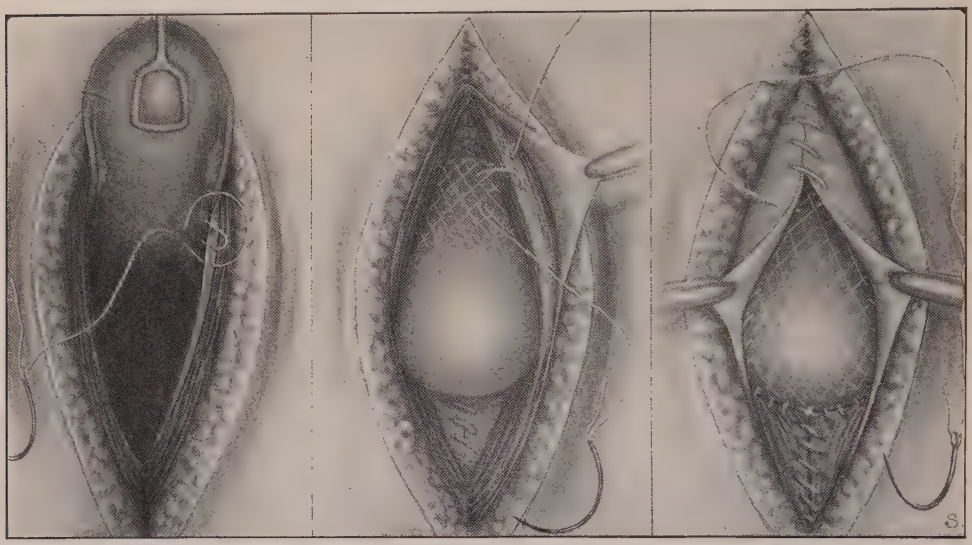


Fig. 162. Fig. 163. Fig. 164.

Fig. 162. Implantation of the uterus in the abdominal wall (Harris method). Uterus brought up into the lower part of the wound, and the peritoneum being closed about it.

Fig. 163. The corpus uteri laid back on the closed peritoneum. The scarified uterus is fastened securely to the rectus muscle of each side.

Fig. 164. The rectus muscles sutured securely to the corpus uteri. The aponeurosis is being closed over and sutured to the scarified uterus.

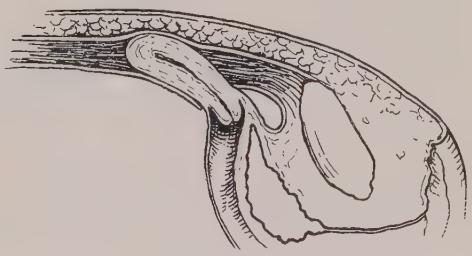


Fig. 165.

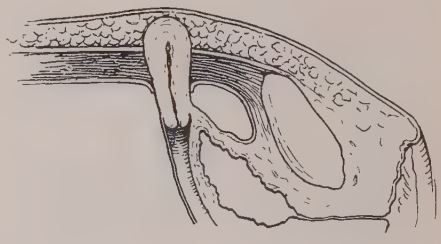


Fig. 166.

Fig. 165. Sectional view, showing the relation of the uterus to the layers of the abdominal wall after implantation by the Harris method.

Fig. 166. Sectional view, showing the relation of the uterus to the layers of the abdominal wall after implantation by the Kocher method.

sequestration," is a very satisfactory one. The small uterus is brought up through the lower part of the abdominal incision, and the peritoneum is closed about it (Fig. 162). The corpus uteri is then laid on the closed peritoneum (Fig. 163), the uterine surface is scarified and the rectus muscle of each side

Fig. 167. Fig. 168. Fig. 169.

Fig. 167. Implantation of the uterus in the abdominal wall (Kocher method). The peritoneum has been sutured about the uterus and the muscles and aponeurosis are being sutured.

Fig. 168. The aponeurosis has been sutured about the uterus and the skin is being sutured over it.

Fig. 169. Implantation of the uterus in the abdominal wall (Eastman method). All the layers of the abdominal wall are closed around the corpus uteri, which is held securely in place by hysterectomy pins, placed as here indicated.

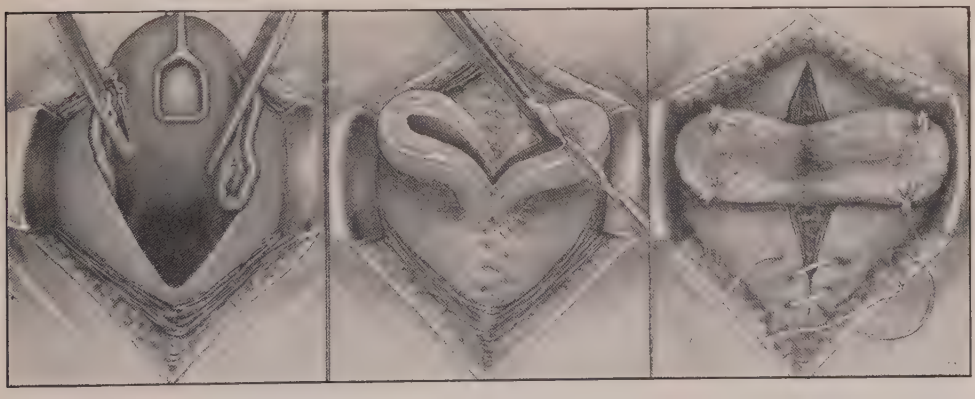


Fig. 170. Fig. 171. Fig. 172.

Fig. 170. Implantation of the uterus in the abdominal wall (Murphy method). The uterus has been drawn up into the lower part of the abdominal wound and the lateral structures have been clamped, preparatory to division and ligation to free the corpus uteri.

Fig. 171. The freed corpus uteri has been bisected and the mucosa is being removed.

Fig. 172. After excision of the mucosa of the two halves of the corpus uteri, they are turned out and fastened securely to the aponeurosis, as here shown. The skin is then closed over, completing the operation.

is sutured to that side of the uterus (Fig. 163). The aponeurosis is then closed, at the same time being sutured to the anterior surface of the corpus uteri, as shown in Fig. 164. After the skin incision is closed, the relaxed pelvic floor is repaired, completing the operation. Fig. 165 shows the relation of the implanted uterus to the layers of the abdominal wall.

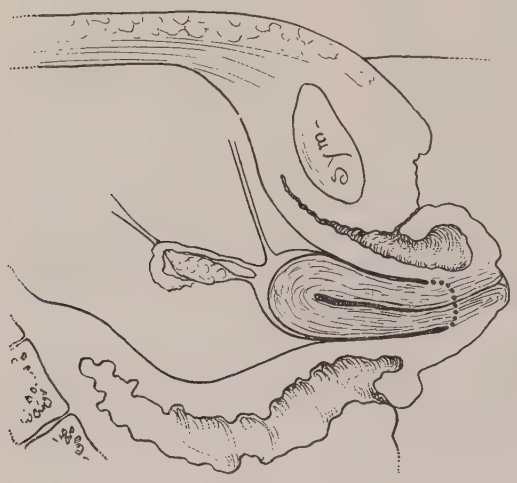


Fig. 173.

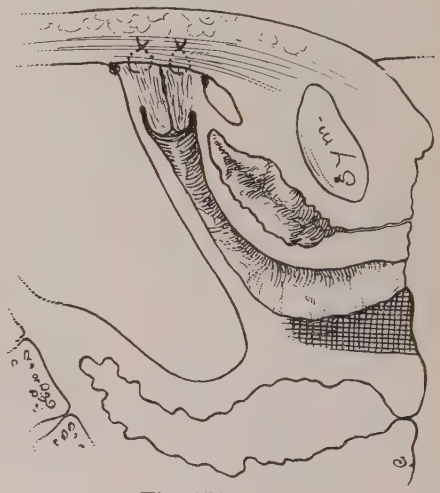


Fig. 174.

Fig 173. Supravaginal hysterectomy with fixation of the cervix to the abdominal wall. The upper part of the uterus is amputated at the dotted line.

Fig. 174. The cervical stump sutured to the abdominal wall. The checked area indicates the pelvic floor repair, which is an essential part of every prolapse operation.

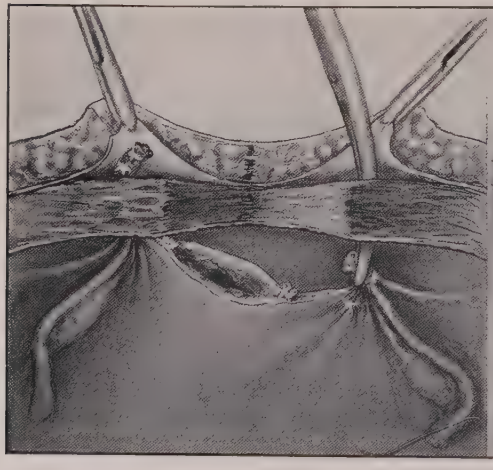


Fig. 175.

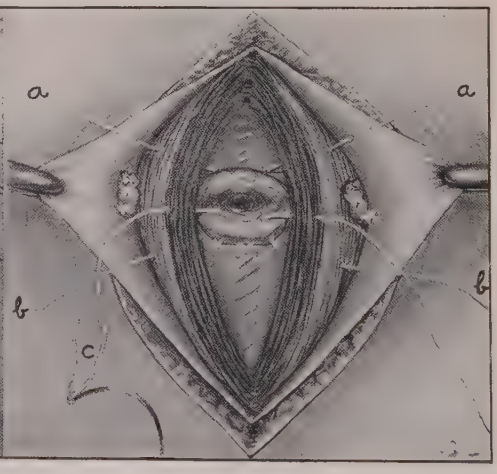


Fig. 176.

Fig. 175. Another method of fixing the cervix uteri to the abdominal wall. The lateral pedicles are fixed close to the cervical stump, and then drawn through the rectus muscle and aponeurosis of each side.

Fig. 176. The cervix itself is then sutured to the muscles, as here shown.

b. In implantation by the Kocher method, the corpus uteri is brought through all the layers of the wall except the skin, as shown in Fig. 166. The various layers of the wall are sutured securely to the uterus, and then the skin is closed over (Figs. 167 and 168).

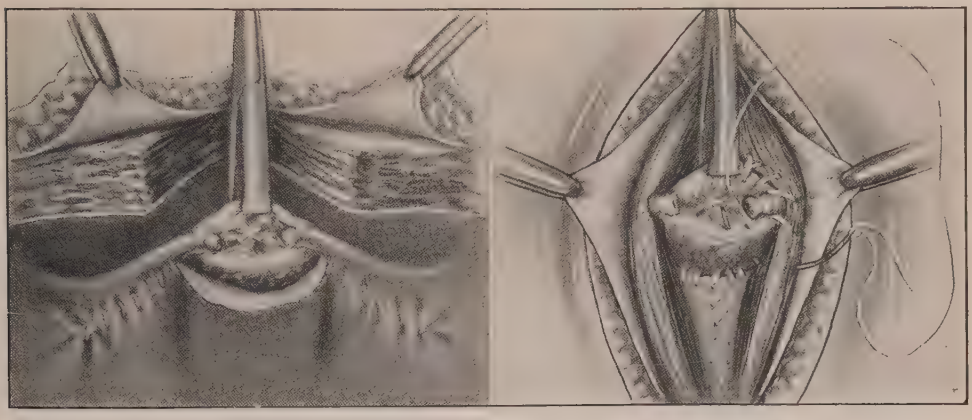


Fig. 177. Fig. 178.

Fig. 177. Another method of fixing the cervix uteri to the abdominal wall. By this method the cervix is drawn up into the wall between the recti muscles and fastened securely to the muscles and to the aponeurosis. Here the cervix is caught with a tenaculum-forceps, preparatory to drawing it up into the wall.

Fig. 178. The cervix has been drawn up into the wall, the peritoneum has been closed about it and the muscle is being sutured to it.

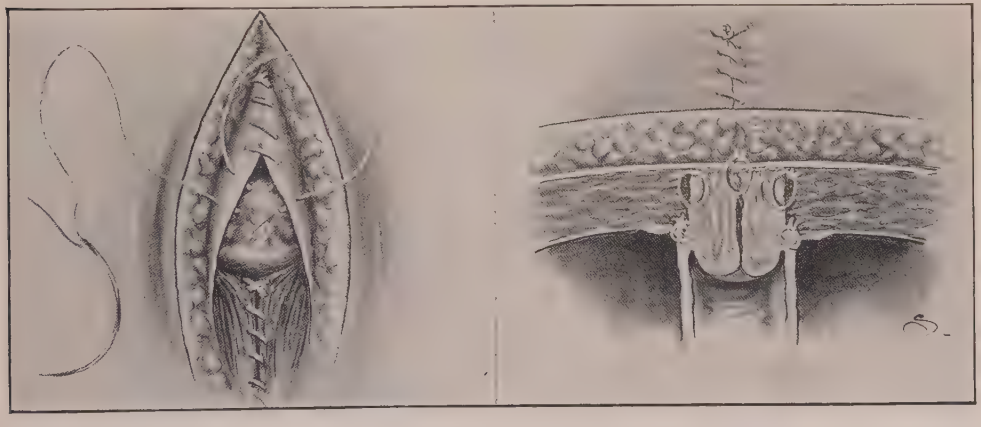


Fig. 179. Fig. 180.

Fig. 179. The aponeurosis is being closed over and at the same time fastened securely to the cervix.

Fig. 180. Sectional view, showing the relation of the cervix to the layers of the abdominal wall.

c. In the "abdominal exclusion" of Eastman, the fundus uteri is brought out onto the abdominal surface and held there by means of large perforating pins, as shown in Fig. 169.

d. In implantation by the Murphy method, the lateral attachments of the corpus uteri are clamped (Fig. 170) and cut and ligated. Then the uterus is divided and the endometrium dissected from each half (Fig. 171). After the tissues of the abdominal wall have been sutured securely about the uterus, each half is turned down over the aponeurosis and sutured there, as indicated in Fig. 172. The skin is then closed over, completing the operation.

XV. Supravaginal Hysterectomy with Fixation of Cervix to Pelvic Pedicles.

Fixation of the cervix to the round ligaments and other pelvic pedicles is now a regular step in all supravaginal hysterectomies, to prevent shortening of the vagina and to give a strong pelvic floor. The technique is described and illustrated under supravaginal hysterectomy for fibromyoma (Chapter VI). In a case of prolapse, special care must be exercised to pull the cervix well up, and then to take up the slack in the pelvic pedicles, so that the cervix is maintained high in the pelvis.

XVI. Supravaginal Hysterectomy with Fixation of Cervix to Abominal Wall.

The corpus uteri is amputated in the usual way at the level indicated by the dotted line in Fig. 173. The cervical stump is then brought up and sutured securely to the abdominal wall (Fig. 174). There are different ways of fastening the cervix uteri to the abdominal wall.

a. It may be simply sutured to the under surface of the wall, as in Fig. 174.

b. The pelvic pedicle of each side may be brought through the rectus muscle to further strengthen the attachment to the wall, as shown in Figs. 175 and 176.

c. The cervical stump, with pedicles attached, may be brought up into the wall (Figs. 177 and 178). The peritoneum is sutured about the stump and then the muscular tissue is sutured to the stump laterally (Fig. 166). The aponeurosis is then closed over, the sutures taking firm hold of the superior surface of the cervical stump, as shown in Fig. 179. The skin wound is then closed, completing the operation (Fig. 180).

XVII. Complete Hysterectomy with Fixation of Vagina to Pelvic Pedicles.

Fixation of the vaginal stump to the round ligaments and other pelvic pedicles is now a regular step in all complete hysterectomies, to prevent shortening of the vagina and to give a better pelvic floor. The technique is described and illustrated under complete hysterectomy for fibromyoma (Chapter VI). In a case of prolapse, special care must be exercised to pull the stump of the vagina well up and then to take up the slack in the pelvic pedicles, so that the end of the vagina is maintained high in the pelvis.

XVIII. Complete Hysterectomy with Fixation of Vagina to Abdominal Wall.

After the removal of the uterus, the resulting opening in the vagina is closed completely. The closed end of the lax vagina is then brought up and fastened securely to the abdominal wall by one of the the following methods:

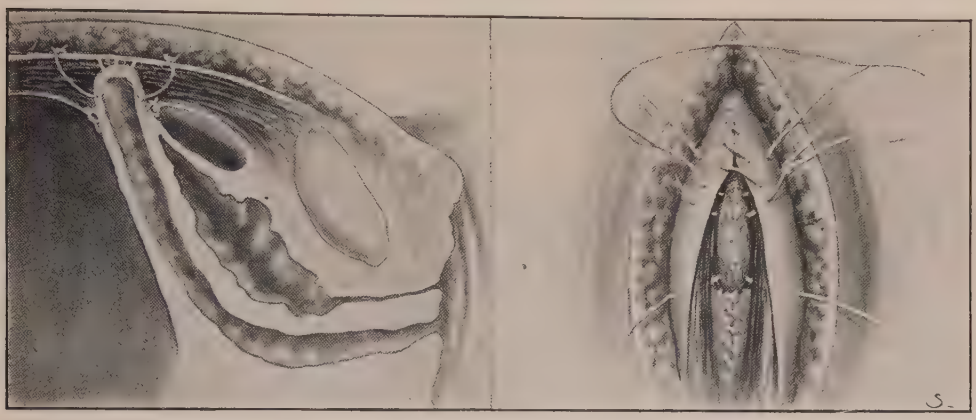


Fig. 181. Fig. 182.

Fig. 181. Complete hysterectomy with fixation of the vagina to the abdominal wall. Sectional view, showing the relation of the vaginal stump to the layers of the abdominal wall.

Fig. 182. Details of the fixation of the closed vaginal stump in the abdominal wall.

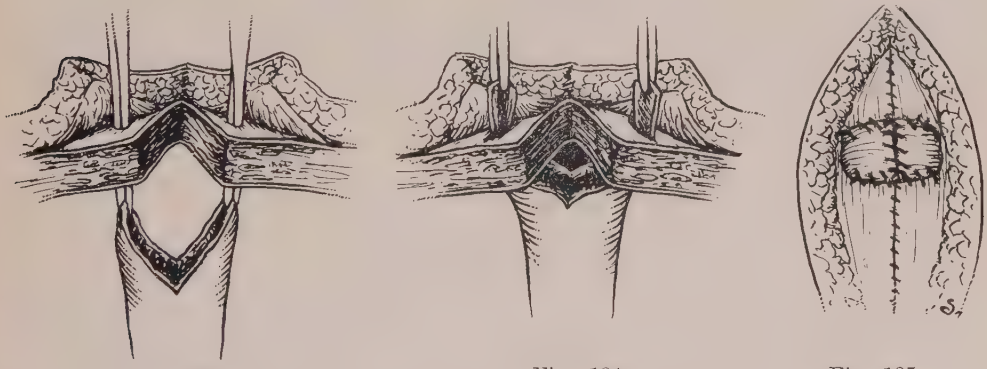


Fig. 183. Fig. 184. Fig. 185.

Fig. 183. Another method of fixing the end of the vagina in the abdominal wall. The end of the vagina has been split and the mucosa removed from the flaps.

Fig. 184. The flap of each side drawn through the corresponding rectus muscle and overlying aponeurosis.

Fig. 185. The vaginal flaps sutured over the closed aponeurosis.

a. The vaginal stump may be sutured by a broad area to the under surface of the recti muscles.

b. The vaginal stump may be brought up between the muscles and sutured to the aponeurosis and the muscles, as indicated in Figs. 181 and 182. Pene-

tration of the vaginal mucosa by the sutures should be avoided. This method gives secure fastening. The sutures should be of 40-day catgut, or nonabsorbable material may be used if preferred.

c. In a very troublesome case, Crile employed the method shown in Figs. 183, 184 and 185. The end of the vagina was split, and the mucosa of the portion to be used was excised. The ends were then drawn through the recti muscles and the aponeurosis, as shown in Fig. 184, and fastened by sutures (Fig. 185).

Ventral Fixation of Old Vaginal Stump. Many years ago, vaginal hysterectomy was frequently employed for uterine prolapse. In some cases the patient returned later with severe prolapse of the bladder and vagina. A satisfactory method of dealing with this condition is to open the abdomen, bring up the vaginal stump and fasten it securely in the vaginal wall, as shown in Figs. 181 and 182.

In two cases, Harris threaded the round ligaments through the end of the vagina. After disinfection and packing of the vagina, the abdomen was opened and a small hole was made into the vagina at each side of the stump. The round ligaments were then threaded through the vaginal stump, the left ligament from left to right, the right ligament from right to left. The ligaments were then drawn taut, and the free end of each ligament was fastened to the opposite side of the pelvis near the internal inguinal ring. It is preferable to excise the mucosa from the vaginal vault, where the ligaments are to pass through.

FUNCTION OF PREGNANCY PRESERVED.

A. ABDOMINAL OPERATIONS.

XIX. Shortening of Utero-sacral Ligaments.

The technique of abdominal shortening of the utero-sacral ligaments has been given in the preceding chapter (Figs. 69 to 80).

XX. Shortening of Round Ligaments.

The technique of abdominal shortening of the round ligaments has been given in the preceding chapter (Figs. 6 to 23).

XXI. Repair of Utero-pubic Fascial Plane from Above.

1. An incision is made through the peritoneum at the vesico-uterine fold (Fig. 186) and the bladder is separated from the uterus and broad ligaments and vaginal wall, as far as the urethra in severe cases.

2. The tissues forming the floor of this area, representing the utero-pubic fascial plane and the vaginal wall, are then plicated by two or more rows of buried sutures as indicated in Fig. 186. The sutures may be interrupted or continuous, as preferred. The vagina should have been previously disinfected, as some of the sutures may penetrate entirely through the vaginal wall.

3. The peritoneal opening is then closed by a running suture (Fig. 187), and the additional procedures preferred are carried out.

The method of attacking the utero-pubic fascial plane by way of the abdomen, was developed by Polk, who combined with it a number of accessory procedures, as follows:

a. Shortening of the broad ligament and utero-sacral ligament of each side. This was accomplished by means of a strong suture which was passed from before backward through the broad ligament, half an inch (1.2 cm.) above the uterine artery and one-third of an inch (0.8 cm.) from the uterus, then through the utero-sacral ligament about an inch (2.5 cm.) from the uterus, and then

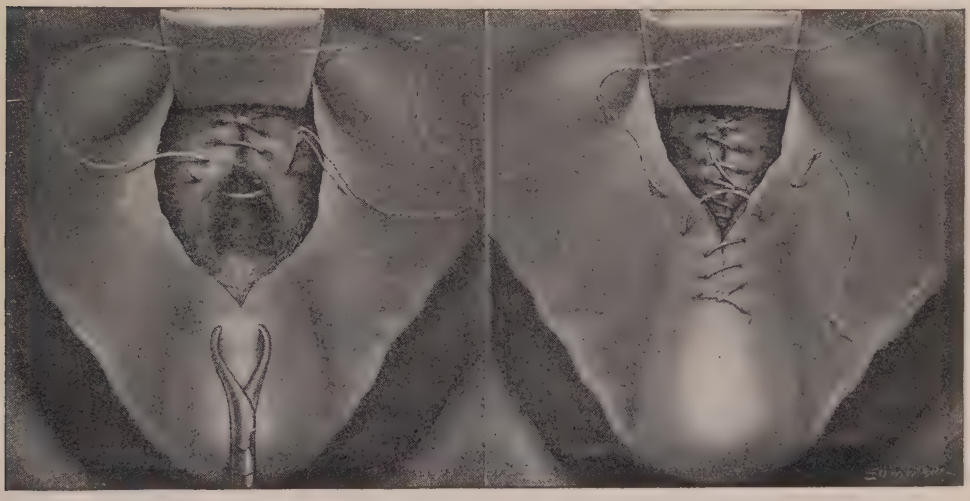


Fig. 186. Fig. 187.

Fig. 186. Repair of utero-pubic fascial plane from above—Polk technique. The bladder has been separated from the uterus and drawn forward by a retractor, and the first row of buried sutures is being placed in the utero-pubic fascia.

Fig. 187. The utero-pubic fascia has been repaired, so as to form a strong side-to-side sling, and the peritoneal incision is being closed.

back through the broad ligament from behind forward, just below the ovarian ligament. The suture was then passed deeply into the anterior portion of the utero-vaginal junction. A similar suture was passed on the other side. The sutures were left lax, to be tied after the completion of the work on the utero-pubic fascial plane, which was then carried out.

b. Plication of the round ligaments and slack peritoneum of the broad ligaments, on the front of the uterus in such a way as to take up the slack and assist in holding the uterus forward.

c. Vaginal work, to further improve the pelvic support. This consisted, first of further suturing of the plicated vaginal wall, with or without excision of redundant tissue, and, second, of repair of the pelvic floor.

FUNCTION OF PREGNANCY PRESERVED.

B. VAGINAL OPERATIONS.

XXII. Repair of Utero-pubic Fascial Plane by Plication.

The utero-pubic fascial plane supporting the bladder is shown diagrammatically in Figs. 188 and 189, A. When overstretched, as in prolapse, it permits sagging of the base of the bladder (Fig. 177, B). As the prolapse increases the sagging becomes more and more marked (Fig. 177, C.) until the characteristic fixation of the trigone has entirely disappeared and the base of the bladder, with its covering fascial plane and vaginal wall, lies more or less outside the body.

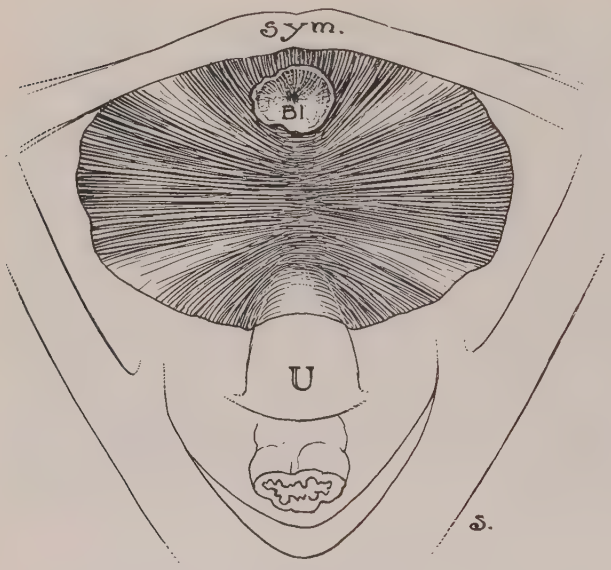


Fig. 188.

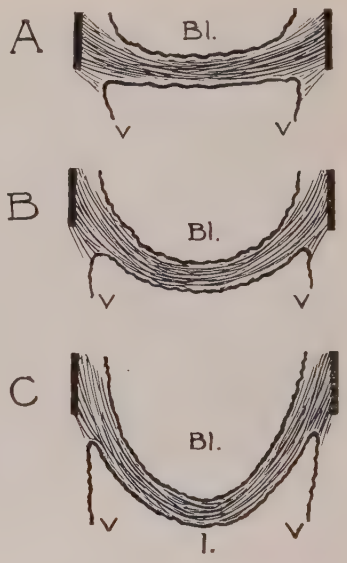


Fig. 189.

Fig. 188. The utero-pubic fascial plane from above, with bladder removed.

Fig. 189. *A.* That portion of the utero-pubic fascia which forms the side-to-side sling beneath the bladder. *bl.* Bladder cavity. *v.* Vaginal wall. *B.* The sling moderately relaxed. *C.* The sling greatly relaxed, as in well marked cystocele.

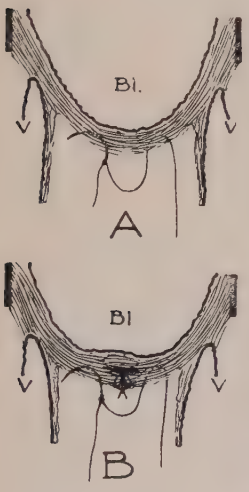
Even though the cervix uteri be fastened well backward and upward and the fundus well forward, the slack in this fascial sling must be taken up or the bladder will not be properly supported.

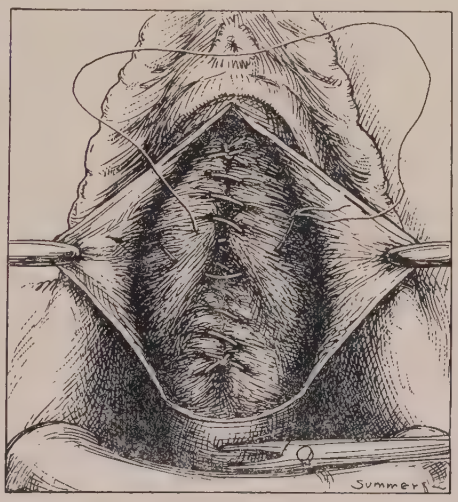
This is accomplished per vaginam, by separating the bladder and overlying fascia, widely from the redundant vaginal wall. The bladder is separated from the uterus, also, for a greater or less distance depending upon the case. The fascial tissues are then brought together by two or three rows of buried sutures, as shown in Figs. 190, 191 and 192.

When the slack in the lax utero-pubic fascial plane has been taken up so that it forms a strong side-to-side sling under the bladder (Fig. 192, A), the excess

of vaginal wall is trimmed away and the edges of the vaginal wound securely approximated, further strengthening this upper pelvic sling (Fig. 192, B). For the suturing, it is advisable to use 40-day catgut throughout.

In all the suturing, care must be exercised to keep all the tension from side to side. There must be no antero-posterior tension, which would tend to draw the uterus forward. Circular purse-string sutures are entirely out of place in this situation. Much harm has been done by the Stoltz purse-string operation for cystocele. The resulting scar-tissue improved the cystocele temporarily, but by drawing the cervix forward it increased the tendency to prolapse and created a condition most difficult to deal with subsequently.





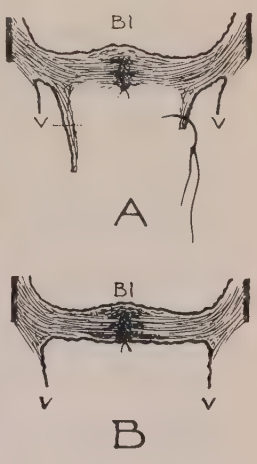


Fig. 190. Fig. 191. Fig. 192.

Fig. 190. Repair of utero-pubic fascial plane per vaginam. *A*. Vaginal wall reflected and first row of buried sutures being introduced. *B*. Two rows of buried sutures completed and the third being introduced.

Fig. 191. Taking up the slack in the utero-pubic fascia by rows of buried sutures.

Fig. 192. *A*. Introducing the suture for closing over the vaginal wall. *B*. The repair of the utero-pubic fascia completed.

Goffe technique. Goffe, in repairing the utero-pubic fascial plane, spreads out the base of the bladder by attaching it high on the uterus and the broad ligaments. The bladder is separated from the vaginal wall and from the uterus as usual. Then the vesico-uterine peritoneal pouch is opened and the opening widened so that it extends out on the broad ligament of each side. Three chromicised catgut sutures are then passed, one through the middle of the anterior wall of the uterus and the other two, one on each side, through the anterior wall of the broad ligament just outside the lateral margin of the uterus. The sutures are left long and protrude outside the vagina with the needle still attached to each. The first of the three sutures is now made to catch up the middle of the base of the bladder at such point that when the suture is tied, the portion of the bladder

wall from the suture to the urethra will form a straight line. This suture is left lax and the lateral suture of each side is made to catch up a portion of the base of the bladder, an inch to an inch and a half (2.5 to 4 cm.) lateral to the median suture. These are left lax. The three sutures are then tied, beginning with the central one. The fascial structures are then repaired and the vaginal wound closed after trimming away the excess. In conjunction with this, and preceding it, Goffe shortens the utero-sacral ligaments and the round ligaments, both per vaginam. After the vesico-uterine peritoneal pouch is opened, the corpus uteri is brought out as in the interposition operation. Through the vaginal wound, the utero-sacral ligaments are shortened (Figs. 136 and 137), then the corpus uteri is returned to the abdominal cavity and the round ligaments shortened (Figs. 102 and 103), and then the base of the bladder is spread out as above described, after which the fascial plane is repaired.

XXIII. Repair of Utero-pubic Fascial Plane by Overlapping.

This operation was developed in 1917 independently by Rawls (Jour. of Obstetrics, March, 1918) and Neel (Surgery, Gynecology and Obstetrics, Sept., 1919). The idea is to separate the bladder from the fascia and the uterus, then separate the fascia from the vaginal wall and then to overlap the lateral halves of the fascial plane. It is carried out by the following steps:

1. An incision is made in the median line in the anterior vaginal wall from one cm. back of the meatus to one cm. in front of the cervix. As soon as an edge on each side can be grasped with forceps, they are used as tractors and the incision is carried carefully toward the bladder until the bladder wall can be demonstrated by blunt dissection laterally, as in beginning the interposition operation (Fig. 119). This means that the operator is in the second line of cleavage, the first line of cleavage being just under the vaginal mucosa and not very evident in the median line.

2. By blunt dissection the bladder is separated laterally and downward to the cervix. The bladder is attached to the cervix by a group of fibers called the utero-vesical ligament (Fig. 120). These fibers will need to be cut to release the bladder from the cervix. It is well to keep close to the median line and cut no more than necessary to release the bladder for gauze-separation from the cervix. By the gauze-covered finger the bladder is separated from the cervix up to the peritoneal reflexion and also laterally and also anteriorly from the utero-pubic fascia as far forward as the urethra (Fig. 193). If there is urethrocele, the separation is carried forward to the meatus.

3. The utero-pubic fascial plane is now separated from the vaginal mucosa as indicated in Fig. 193. Rawls calls attention to the fact that these two structures are densely adherent to each other in the median line and gives the following technique by which he has always been able to make the separation, even in the thinned out tissues of elderly multipara with long standing prolapse. "With a finger under the mucosa as a guide on which to cut down, the

thinned-out fascial edge is dissected with a knife from the underlying mucosa (Fig. 193). The mucosa flap is made paper-thin and as soon as possible Allis' forceps are applied as tractors to the fascial and mucosal edges. This cutting dissection is continued from the midline downward and upward for a short distance laterally (Fig. 193) until by blunt dissection a distinct line of cleavage is demonstrated the whole length of the primary incision. The mucosa is now easily separated, by blunt dissection, from the overlying pil-

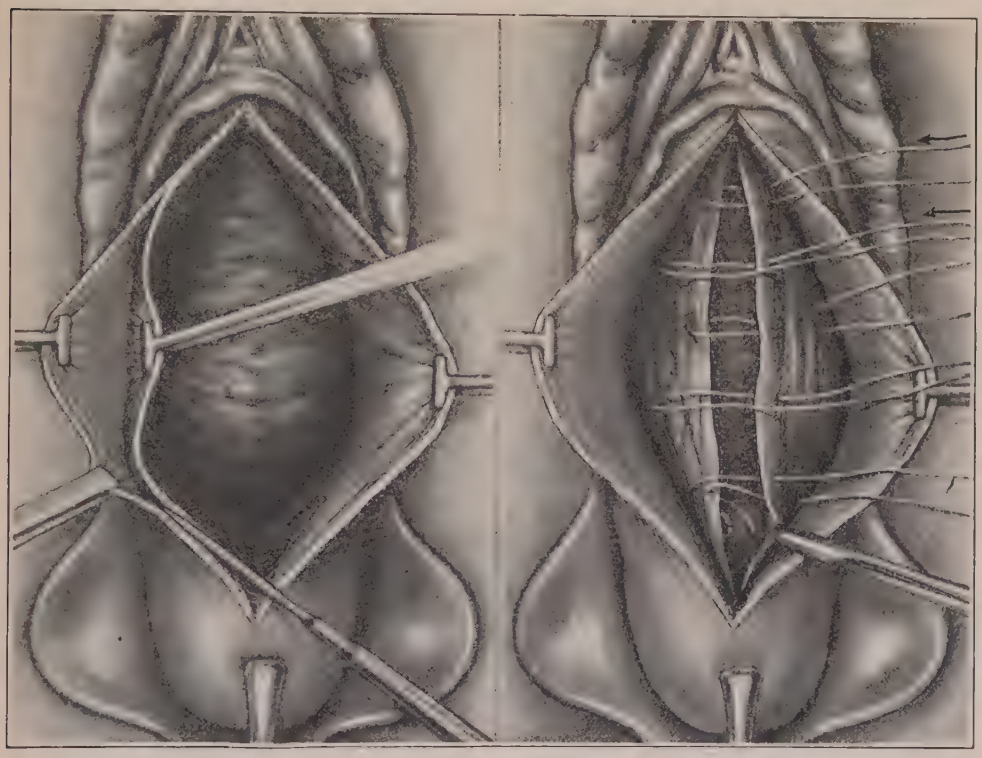


Fig. 193. Fig. 194.

Fig. 193. Repair of Utero-pubic Fascial Plane by Overlapping (Rawls technique). Beginning the separation of the utero-pubic fascia from the vaginal wall.

Fig. 194. The sutures in place for overlapping the two halves of the utero-pubic fascia. The lower suture performs the additional function of fastening the fascia high up on the uterus at the level of the internal os.

lars well out on each side to the 'arcus tendineus.' Thus is demonstrated the strongest and thickest portion of the fascia and it gives us two fixed points from which to estimate the amount of overlapping necessary to take up the slack in the fascial sling. The dissection is quite extensive but is comparatively free from bleeding unless by accident we injure the vaginal plexus of veins or the vaginal branch of the vesical artery which runs on the pubovesical ligament." After the start is made with a knife as in Fig. 193, the separation of the fascia from the vaginal wall is carried on by gauze dissec-

tion—the gauze-covered finger being given a combined pushing and rolling motion as indicated in Figs. 195 to 197.

4. The two sides of the divided utero-pubic fascial plane are now overlapped by mattress sutures of chromic catgut or kangaroo tendon, the latter being preferred by Rawls. Fig. 194 shows the course of the mattress sutures. The needle should be entered far out to the side so that when tied the sutures will draw the edge of the other flap well over to that side. Another point to be kept in mind in the suturing is to restore the uterine attachment of the utero-pubic fascia to the level of the internal os. This is accomplished by passing a mattress suture as shown in Fig. 194. After the deeper mattress sutures have been tied, drawing one flap under the other, the free edge of the upper flap is sutured well out to the opposite side (Fig. 198). The excess of vaginal mucosa is then trimmed off (Fig. 199), being careful not to trim off too much, and the vaginal wound is closed by interrupted chromic suture. To pre-

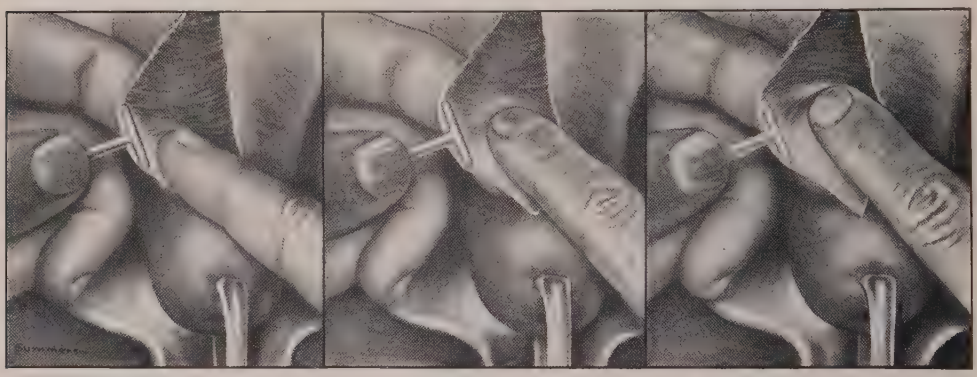


Fig. 195. Fig. 196. Fig. 197

Figs. 195, 196 and 197. The combined pushing and rolling movement by which the fascia is most easily separated from the vaginal wall. This movement is readily appreciated by noting accurately the change in the position of the right index finger-tip from the beginning to the end of the movement as shown in the three illustrations. The left index finger furnishes the counter-pressure, against which the gauze-covered right index finger works effectively. The fingers are shown here ungloved and without gauze, so that the points mentioned may be more clearly seen.

vent separation of the superimposed layers by oozing, a light vaginal pack of iodoform gauze may be used, to be removed the fourth day after operation. It is important in the suturing to avoid any antero-posterior shortening and this is avoided with most certainty by the use of interrupted sutures throughout, Figs. 198 and 199.

XXIV. Shortening of Round Ligament by Fixation to Front of Uterus.

The technique of vaginal shortening of the round ligaments by suturing them to the anterior surface of the uterus, is given in the preceding chapter (Figs. 101 and 103).

XXV. Shortening of Round Ligaments by Fixation to Vaginal Wall.

The technique of the vaginal shortening of the round ligaments by suturing them to the vaginal wall or fascia is given in the preceding chapter (Figs. 104 and 105).

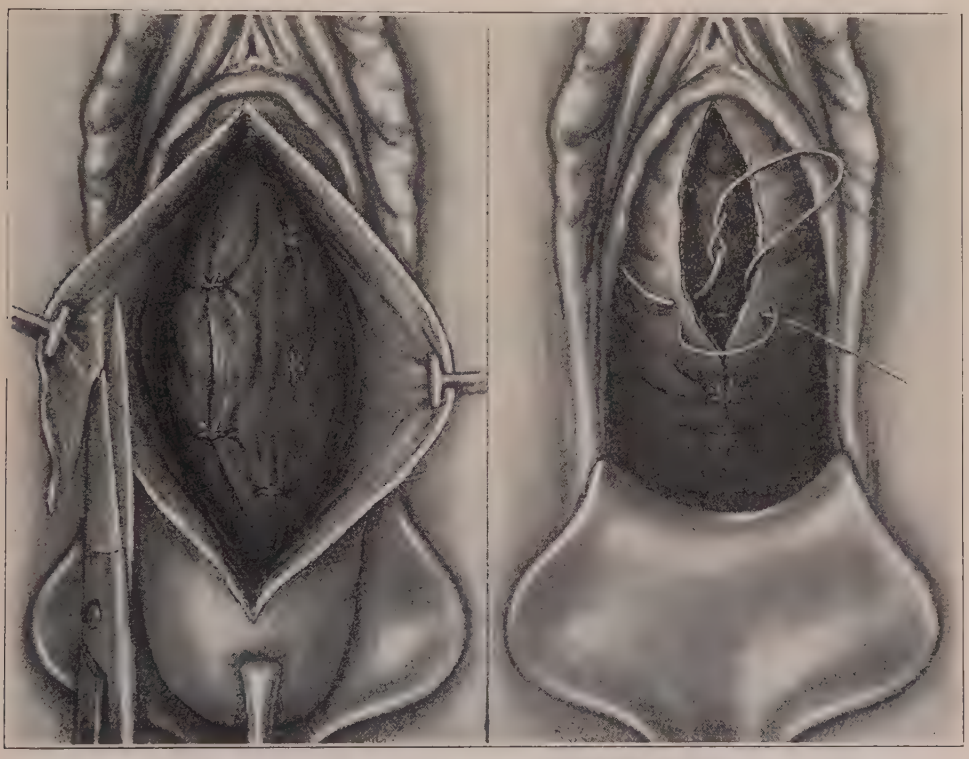


Fig. 198. Fig. 199.

Fig. 198. The sutures tied, overlapping the two sides of the fascia. The excess of vaginal wall is being trimmed off.

Fig. 199. Closing the vaginal wound. Interrupted sutures (single or double) are preferable, in order to prevent antero-posterior shortening of the vaginal wall.

XXVI. Shortening of Broad Ligaments by Folding in Front of Cervix (Alexandroff).

The broad ligaments and the utero-sacral ligaments are the main supporting structures of the uterus in the upper pelvic plane. The principal part of the supporting tissue of each broad ligament lies in the lower portion (Fig. 200), forming a strong mass of tissue extending from the cervix uteri outward and upward to the pelvic wall in the region of the "white line." So important is this in supporting the uterus, that it has been named the "ligamentum cardinale." In a case of prolapse, all these structures are much lengthened.

When this strong portion of the broad ligament of each side is adequately shortened, a most important step has been taken toward permanent correction of the prolapse. This may be accomplished by (a) folding the lower portion of the broad ligaments in front of the cervix, or (b) by severing the lower portion

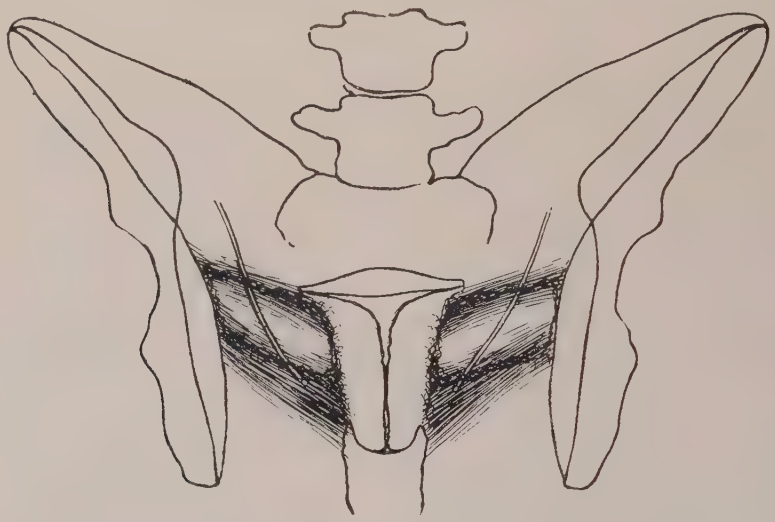


Fig. 200. The supporting tissue in the lower part of the broad ligament, with vessels and ureters to be avoided in shortening the same.

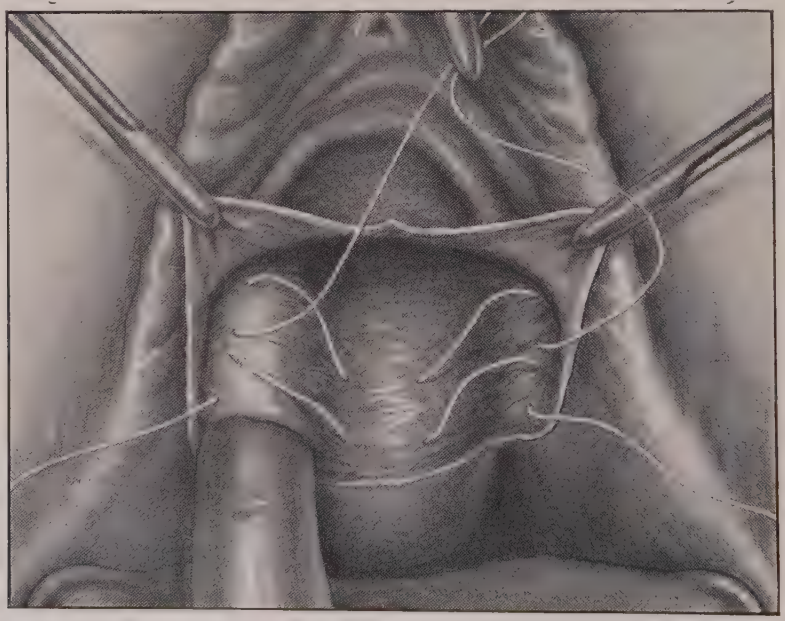


Fig. 201. Shortening of the broad ligaments per vaginam (Alexandroff method). The supporting tissue of each side below the uterine artery and the ureter has been isolated and the shortening sutures introduced.

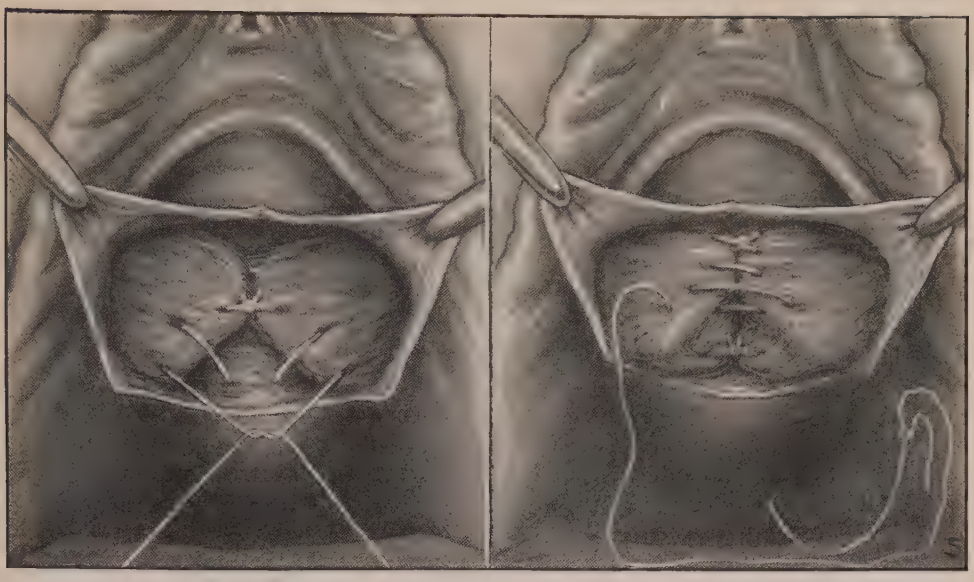


Fig. 202. Fig. 203.

Fig. 202. Bringing the ligaments together in front of the cervix.
Fig. 203. Completing the coaptation of the ligaments in front of the cervix.

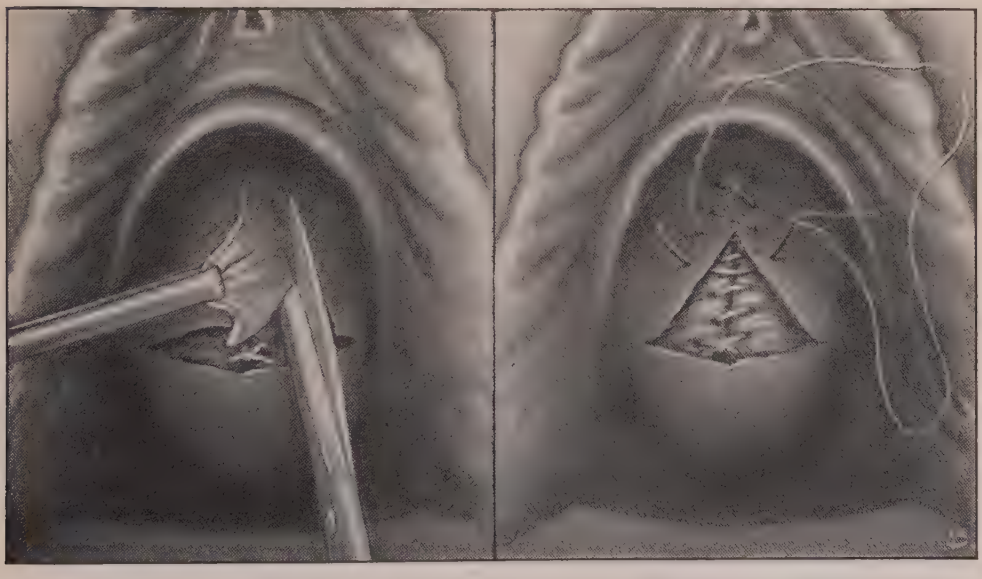


Fig. 204. Fig. 205.

Fig. 204. Excising the excess of vaginal wall.
Fig. 205. Closing the vaginal wound.

of the ligaments and uniting them in front of the cervix. The former operation, devised by Alexandroff in 1903, is carried out as follows:

1. Through an incision in the anterior vaginal wall, the bladder is separated from the cervix uteri, and from the broad ligaments laterally, and from the redundant vaginal wall. The incision is extended laterally on the cervix far enough to permit isolation of the lower part of the broad ligament on each side, as indicated in Fig. 201.

2. Under the guidance of the finger, sutures are introduced, as shown in Fig. 201, taking firm hold of the strong lower portion of the ligament on each side below the vessels and the ureter. The latter has been pushed out of the way by the wide separation of the bladder from the ligaments. The sutures should pass through the cervix rather low, so that when tied they will bring the included ligaments to the lower part of the cervix.

3. When the sutures have been passed (as many as desired) they are tied, thus approximating the lower portions of the broad ligaments in front of the cervix, as shown in Fig. 202. The ligaments are then further sutured together, as indicated in Fig. 203. This makes the fastening more secure and also carries the cervix still further upward and backward.

4. The excess of vaginal wall is then trimmed away (Fig. 204) and the vaginal wound closed (Fig. 205).

XXVII. Severing of Round Ligaments and Approximation of Same in Front of Cervix (Hertzler, Dudley).

This procedure affords another example of that singular phenomenon of two men working independently and developing practically the same operation at the same time.

Hertzler, in a paper read before the South Kansas Medical Society, in April, 1906, presented this operation. He had studied the ligaments by dissection in forty adult bodies and in several newborn infants, and had carried out the operation in forty-six patients in the preceding four years.

Dudley, in an article read before the American Medical Association, in June, 1906, presented this operation. He had for some years been making a general study of the utilization of the broad ligaments in uterine prolapse and in hysteromyomectomy, and gradually advanced to the operation of severing the lower portions of the broad ligaments from the uterus and approximating the same in front of the cervix.

As to the technique, the first steps are practically the same as in anterior coaptation of the broad ligaments by the Alexandroff method. An incision, longitudinal or longitudinal and transverse as preferred, is made in the anterior vaginal vault. The bladder is separated from the vaginal wall and from the cervix and then from the broad ligament of each side for a considerable distance laterally. This separation of the bladder from the broad ligaments carries the

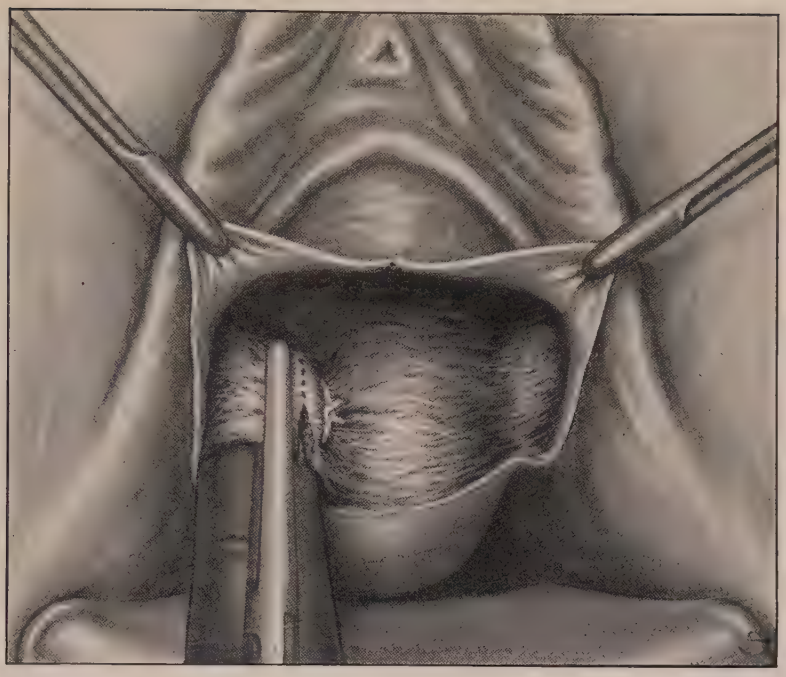


Fig. 206. Shortening the broad ligaments per vaginam (Hertzler-Dudley method). Supporting tissue in the lower part of the right broad ligament isolated and ready for division.

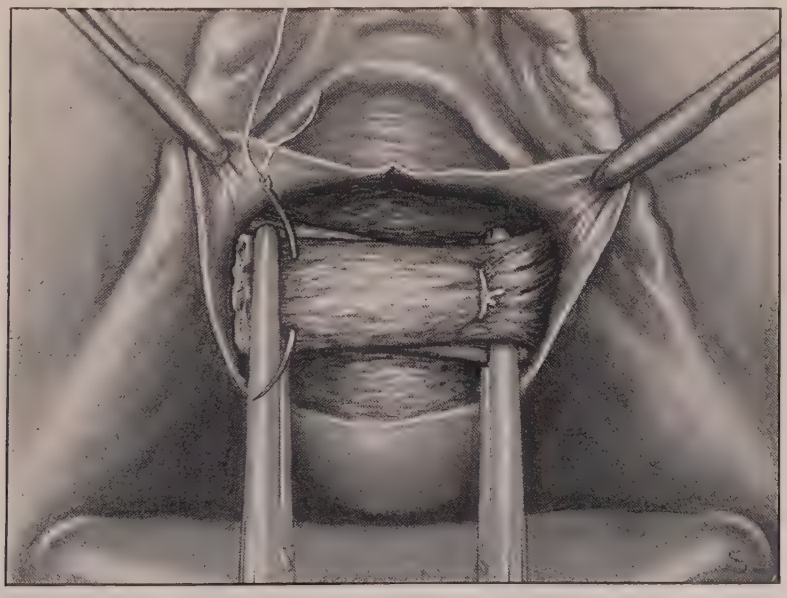


Fig. 207. Both ligaments isolated, divided, crossed in front of cervix and being sutured together and to the cervix.

ureters up out of the way. The lower portion of each broad ligament is isolated with the finger, as indicated in Fig. 201.

Then the selected portion of tissue on each side is caught with a forceps and severed. If the tissues are very lax and the veins enlarged, it is well to put a ligature close to the uterus, and cut distal to that, as indicated in Fig. 206. If the uterus is atrophic and the blood vessels not troublesome, this ligature may be dispensed with and the cut made close to the uterus or even into the uterine tissue. After the ligaments are severed, they are brought in front of the cervix and fastened securely to each other, and to the cervix (Fig. 207). This carries the cervix well backward and upward. Hertzler overlapped the ligaments, while Dudley brought them together end to end.

XXVIII. Shortening of Utero-sacral Ligaments by the Jellett Technique.

Vaginal shortening of the utero-sacral ligaments may be carried out by the Jellett method, described in the preceding chapter (Figs. 108 and 109).

XXIX. Shortening of the Utero-sacral Ligaments by the Martin Technique.

By means of forceps the utero-sacral ligament of each side is drawn through the broad ligament and fastened by suture in front of the cervix, as mentioned in the preceding chapter.

XXX. Amputation of Glandular Area of Cervix.

If there is cervicitis and glandular hypertrophy, the inner portion of the cervix, comprising the glandular area, may be excised leaving the outer portion to be closed over as a flap. The technique is given in Chapter V.

XXXI. Regular Amputation of Cervix.

If there is marked elongation of the cervix, the excess may be removed by the regular wedge-shaped amputation described in Chapter V. Care should be taken, however, to amputate only the excess of the cervix, leaving enough cervix to insure a good length to the uterus. If the uterus is too much shortened it tends to work out past the perineum and again prolapse.

SPECIAL COMPLICATIONS.

XXXII. Abdominal Obliteration of Posterior Culdesac.

Retro-uterine hernia is an occasional complication of uterine prolapse, and failure to recognize it and deal with it may cause a poor operative result. Where this condition is present, in addition to the abdominal measures for the uterine prolapse, the culdesac of Douglas is scarified or otherwise roughened, and obliterated by sutures.

XXXIII. Vaginal Obliteration of Posterior Culdesac.

When retro-uterine hernia is present in a case of uterine prolapse which is being handled by vaginal operation, care should be taken to open the culdesac per vaginam and obliterate it by sutures.

XXXIV. Colopexy.

In some cases of prolapse of the uterus, bladder and vagina, the condition is aggravated by ptosis of the intestine, particularly of the cæcum and sigmoid. This ptosis may cause persistent troublesome symptoms and it also increases the tendency to recurrence of the genital prolapse. In such a case the correction of the genital prolapse should be supplemented by colopexy. Mauclaire called attention to this point and reported two cases so treated.

Through the abdominal incision, the prolapsed portion of the colon (sigmoid, cæcum or both, as the case may be) is raised to its proper place and attached securely in the iliac fossa or along the ilio-abdominal angle. If preferred, the colon may be fixed to the anterior abdominal wall. If there is associated rectal prolapse, the rectum also may be drawn up and attached in the iliac fossa after the method of Quenu and Duval.

CHOICE OF OPERATION.

In practically all cases of decided prolapse of the uterus there is also more or less prolapse of the bladder, for which provision must be made in the treatment. In selecting treatment for prolapse of the uterus and bladder, it is convenient to group the cases into two principal classes. One class includes those patients past the menopause, while the other class includes those patients still in the childbearing period.

When we come to apply the therapeutic measures to the patients, we find there is a marked difference in the conditions present in individuals of the same general class—and these conditions have an important bearing on the selection of treatment. Arranged, then, according to the conditions bearing on the choice of treatment, the patients are grouped in classes and subclasses as follows:

A. Past the Menopause.

I. Uterus in condition to be preserved.
II. Uterus requires removal.
III. Posterior culdesac hernia.
IV. Other items.

B. The Childbearing Period.

I. Function of pregnancy to be preserved.
II. Function of pregnancy to be sacrificed.
III. Posterior culdesac hernia.

A. PAST MENOPAUSE.

I. Past menopause. Uterus in condition to be preserved. This subclass includes a large proportion of the cases of severe prolapse. Furthermore, permanent cure by the older plastic operations proved particularly difficult in these elderly patients, because of the severity of the bladder prolapse, which tended to gradually recur.

1. *Interposition operation.* When the uterus is in a fairly healthy condition and there is no complication requiring abdominal section, the interposition operation (Figs. 119 to 123) is the one of choice. It has proved an exceedingly satisfactory method for taking care of the uterine and bladder prolapse in the class of cases under consideration. It is particularly useful in that it permanently corrects the marked bladder prolapse, which so frequently occurs in aged patients and which has proved so refractory to other methods of treatment. As the patients are past the menopause and the uterus is of normal size, no special steps are necessary and the operation may be carried out quickly—an important consideration in aged patients, who are often poor operative risks. Executed accurately it gives permanent correction of the uterine and bladder prolapse with a minimum of operative work and a minimum disturbance of tissue. The bladder need be separated only sufficiently to bring down the fundus uteri and to permit excision of the redundant portion of the vaginal wall.

If the cervix is badly lacerated and the seat of chronic inflammation and numerous cysts, the amputation of the diseased area, as indicated in Figs. 134 and 135, should be added to the regular steps of the interposition operation. Thorough repair of the pelvic floor is an integral part of the operation in all cases.

Uterus rather large. If the enlargement is only slight and is due to subinvolution or other cause not likely to give subsequent trouble, the uterus may be utilized in the regular interposition operation, care being exercised to make very secure fastening.

If the enlargement is more marked, the uterus approaching twice the normal size, it may be reduced to suitable size by excision of a portion, provided, of course, that conditions are otherwise favorable to its preservation. The reduction in size may be conveniently accomplished by the wedge-shaped excision, shown in Figs. 141 and 142. Another method of reducing the size of the uterus and removing all tissue not needed for support, is to split the uterus along the anterior surface, and then excise the mucosa and as much of the myometrium as thought advisable, as shown in Figs. 143 to 146.

Uterus small. When the atrophy is only moderate and the uterus still presents a considerable mass of firm supporting tissue for use under the base of the bladder, the interposition operation (Figs. 119 to 133) may be employed. For success in this operation it is necessary that the cervix uteri stay well back in the pelvis after operation. When the uterus is normal size, the length of the

uterus with the repair of the pelvic floor, keeps the cervix well back. If the uterus is short from atrophy or from amputation of the cervix, the cervical end may swing down and forward and gradually work out over the repaired perineum. To prevent this, in cases where the uterus is short, the utero-sacral ligaments may be shortened, as shown in Figs. 136 and 137.

2. *Repair of utero-pubic fascial plane.* This operation will answer the purpose where the prolapse of the uterus and bladder is not severe. The technique is shown in Figs. 190 to 192. The overlapping method (Figs. 193 to 199) gives a stronger result with less likelihood of recurrence.

3. *Implantation of uterus in abdominal wall.* When there are complications requiring abdominal section and the uterus is small and suitable for preservation, it may be implanted in the abdominal wall by one of the methods shown in Figs. 162 to 172. If the prolapse is slight, a simple strong fixation of the fundus uteri to the abdominal wall (Figs. 47 to 51) may be sufficient.

4. *Repair of pelvic floor.* A thorough repair of the relaxed pelvic floor is of course an essential part of all prolapse operations.

II. Past menopause. Uterus requires removal. The conditions of the uterus requiring its removal are various, but each constitutes a disabling lesion in the present or a menace for the future. There may be fibromyomatous nodules or a diffuse adenomyoma. Chronic metritis with subinvolution, sometimes called fibrosis, may cause such enlargement and functional disturbance of the uterus as to make its removal advisable. The hemorrhagic uterus (myopathica hemorrhagica) and the sclerotic hypersensitive uterus should be removed in the operation for prolapse, rather than fastened in place where they will continue to give trouble. A cervix that is the seat of chronic irritation, from laceration and cervicitis or even from cervicitis alone, requires removal—by amputation of the cervix or by complete hysterectomy. The latter is usually preferable in the patients past the menopause, for the uterus is no longer functioning and the corpus also is frequently involved in the pathologic process.

Vaginal exploration. If the uterus is not too large to be easily brought out through an anterior vaginal incision, that method of approach is preferable, providing there are no complications requiring abdominal work. In most cases where the prolapse is marked the uterus is still small enough to be brought out as in the first part of the interposition operation (Fig. 127). This permits direct examination of the corpus uteri. If this direct examination of the uterus confirms the supposition that the structure requires removal, the hysterectomy must be accompanied by measures that restore the supporting planes of the pelvis.

1. *Vaginal combination operation with hysterectomy.* When it is necessary to remove the uterus the conditions may in many cases be best handled by a combination operation comprising vaginal hysterectomy, low fixation of

round ligaments, high fixation of vaginal vault and overlapping of the subvesical fascia. This effective combination procedure is carried out as follows:

a. The antero-posterior vaginal incision is extended around the cervix as shown in Fig. 208 and the cervix is freed posteriorly as well as anteriorly. This isolates the broad ligaments, which are ligated by suture-ligatures, as indicated in Fig. 209. The ligatures are left long and with needle attached for subsequent use.

Fig. 208. Fig. 209.

Fig. 208. Vaginal Combination Operation with Hysterectomy. The first step is to incise the vaginal wall and fascia and separate the bladder from the uterus as in the interposition operation (Figs. 119 and 120). Then the incision is extended around the cervix as here shown.

Fig. 209. The broad ligaments have been exposed and the lower portion of the left ligated. The ligation of the lower portion of the right is just being completed.

b. The fundus uteri is then brought down and the round ligament of one side caught with a forceps and then severed from the uterus (Fig. 210). The tubal and ovarian pedicles are then ligated and cut (Fig. 210) and the ligature is left long but with needle removed. The other side of the uterus is then likewise freed. Fig. 211 shows the relation of the various structures at this stage of the operation. The uterus is free with the exception of a small area of peritoneum, which is then divided and the uterus removed.

c. The round ligaments, which are held in forceps, are ligated and fastened well forward under the bladder, as indicated in Figs. 212 and 213. Lateral retractors are now introduced to expose the vaginal vault, and the left utero-sacral ligament is grasped and brought into view and caught with the deep pedicle suture-ligature, as shown in Fig. 213. The other utero-sacral ligament is caught in like manner and the ligature is tied and cut short, securely fastening the shortened ligament to the vaginal vault (Fig. 214). And then, with the same needle, the vesical peritoneum is sutured to the posterior peritoneum as indicated in Fig. 214. With the same suture the bleeding tissue of the cut vaginal wall is caught (Fig. 215), and the vaginal vault is then closed.

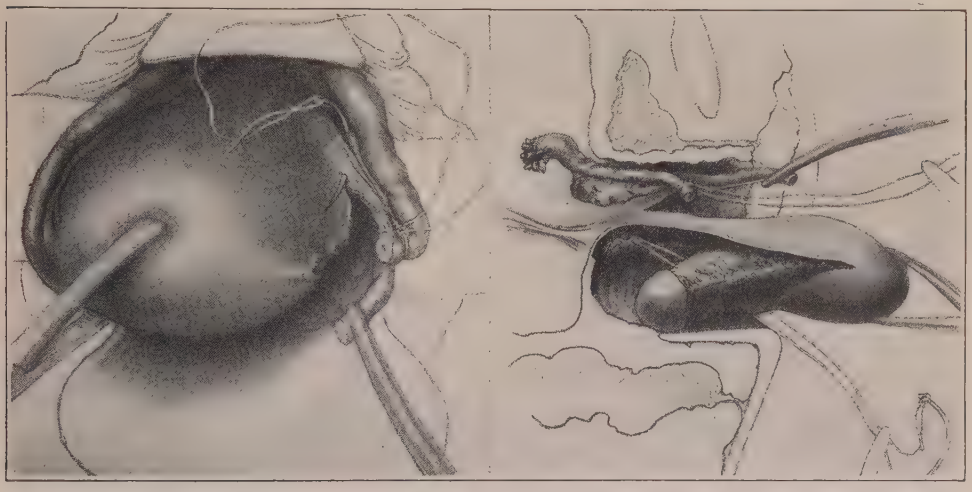


Fig. 210. Fig. 211.

Fig. 210. Ligating the upper portion of the left broad ligament.

Fig. 211. Sectional view, showing the uterus held only by a small portion of peritoneum. The severed wound ligament is held by a forceps. The ligature on the tubo-ovarian pedicle is left long and held by a forceps, the needle being cut off. The ligature on the lower broad ligament pedicle is left long and held by a forceps, the needle being left on for subsequent use as explained in Figs. 213 to 215.

d. The fascial plane is then separated from the vaginal wall of each side and overlapped after the method of Rawls (Figs. 216 and 217). The excess is then trimmed off the vaginal flaps and they are approximated by single or double interrupted sutures, as indicated in Fig. 217.

e. Repair of the pelvic floor.

2. *Partial vaginal hysterectomy with low fixation of cervix.* If the cervix is to be preserved, the corpus uteri is amputated (Fig. 148), leaving as much of the cervix as desired. Along with this partial hysterectomy, the stump of the cervix, carrying the important broad-ligament and utero-sacral attachments, is brought forward and fastened under the base of the bladder, as shown in Figs. 149 to 151.

3. *Abdominal hysterectomy.* If the corpus uteri is too large to be brought out through a vaginal incision, abdominal hysterectomy is indicated. Supravaginal hysterectomy is the operation of choice, if the cervix is healthy. The stump of the cervix is fastened high to the pelvic pedicles (see supravaginal hysterectomy in Chapter VI), or if necessary to the abdominal wall (Figs. 174 to 180). The latter is preferable if the bladder prolapse is marked.

Complete hysterectomy is of course indicated when the cervix is the seat of chronic irritation from inflammatory infiltration and cystic disease. The stump of the vagina is then fastened high to the pelvic pedicles (see complete hysterectomy in Chapter VI) or to the abdominal wall (Figs. 181 to 185). The latter is preferable if the bladder prolapse is an important feature.

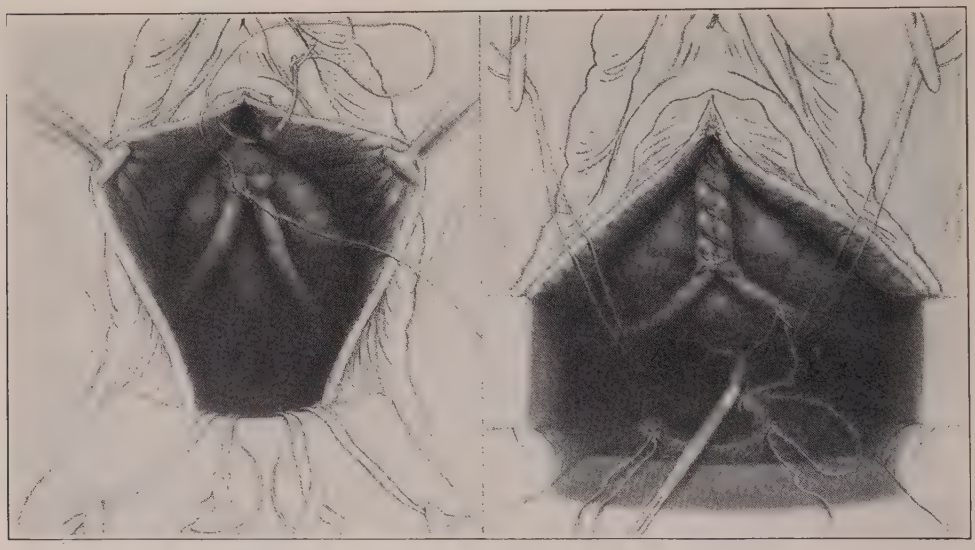


Fig. 212. Fig. 213.

Fig. 212. The round ligaments, which were held by forceps, have been ligated and are being fastened to the fascia under the pubic arch.

Fig. 213. The round ligaments have been sutured together under the bladder. The left utero-sacral ligament is being shortened by the left lower pedicle-ligature which has been left long and with needle attached for that purpose.

If the patient is a poor risk for abdominal operation, a large uterus may, of course, be taken out per vaginam by employing bisection and morcellation. But the risk of bisection of an enlarged and discharging uterus more than overbalances the added danger of abdominal operation in most cases.

III. Past menopause. Posterior culdesac hernia. When the intestinal coils have pushed down the retro-uterine peritoneal pouch until an intestinal hernia lies outside with the prolapsed uterus, a most troublesome condition is present. Any operation, to be effective, must correct this retro-uterine hernia as well as the prolapse of the uterus and bladder. This may be accomplished

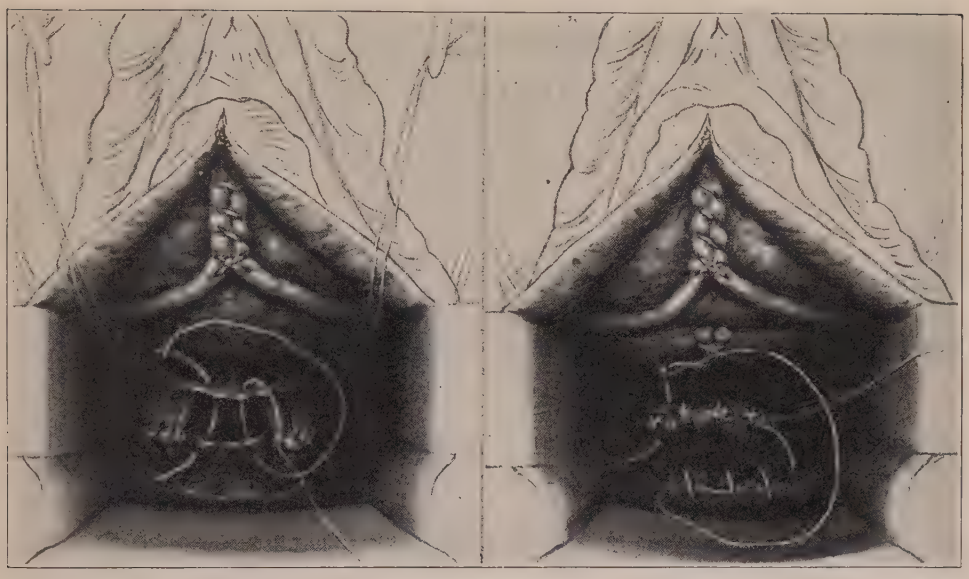


Fig. 214. Fig. 215.

Fig. 214. Both utero-sacral ligaments have been shortened and the peritoneal opening is being closed by one of the same sutures.

Fig. 215. With the same suture the raw edge of the vaginal vault is being caught up, to prevent bleeding.

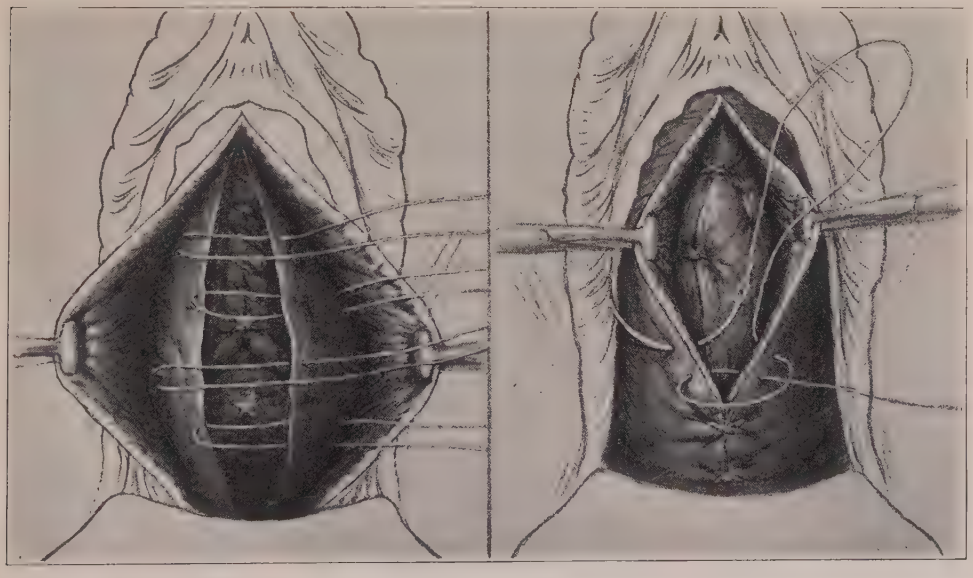


Fig. 216. Fig. 217.

Fig. 216. The utero-pubic fascia is then separated from the vaginal wall and overlapped by the Rawl's technique as here shown.

Fig. 217. Closing the vaginal wound by interrupted sutures.

by obliterating the culdesac with sutures. Whether the prolapse operation be vaginal or abdominal, the peritoneal surfaces of the posterior culdesac are to be scarified and united by sutures over a sufficient extent to cause its practical obliteration. Ries has called attention to the fact that this posterior hernia, unrecognized, is a cause of recurrence in otherwise well-operated cases.

IV. Past menopause. Severity of prolapse. Operative risk. Preferences of patient. The *severity of the prolapse* has, of course, a bearing on the selection of treatment, as pointed out in the preceding remarks. In mild cases, where the bladder prolapse is not marked, simple vagino-fixation, combined with pelvic-floor repair, may be sufficient to give a satisfactory result. In severe cases, on the other hand, extensive operation must be undertaken, and not only must the operation be extensive but it must be one that is suitable for the conditions present in the particular case.

The *operative risk* must be considered. The patient may be in a condition that forbids any extensive operation, in which case a smaller operation must be chosen, though giving less certain promise of permanent result. Again, the patient may be such a poor operative risk that any operation is contraindicated, and palliative treatment (pessaries, etc.) must be relied on to relieve the patient's suffering.

The *preferences of the patient* have a bearing. With the patient, of course, lies the ultimate decision as to whether or not she will undergo the recommended operation. Some patients prefer to get along with the temporary relief afforded by pessaries and other palliative measures rather than seek permanent relief through the ordeal of operation. Again, when operative treatment is decided upon, the preferences of the patient are sometimes the deciding factor as to choice of method. Instead of the usual operations, involving opening of the peritoneal cavity (vaginal section or abdominal section), the patient may prefer the less severe operation of colpocleisis (Fig. 156 to 161).

B. CHILDBEARING PERIOD.

I. Childbearing period. Uterus in condition to be preserved. The features of the problem in such a case are (a) to maintain the cervix uteri in the posterior part of the pelvis, (b) to maintain the fundus uteri in the anterior part of the pelvis, (c) to repair the subvesical fascial plane and (d) to restore the pelvic floor support. All this is to be accomplished by methods which do not interfere with subsequent childbearing. The desired result is secured by a combination of procedures each one of which aids in one or more of the directions mentioned.

The correction of prolapse of the uterus and bladder with preservation of the functionating uterus requires a careful combination of operative measures—the number and character of the steps depending on the pathological changes present in that particular pelvis. The proper handling of a case means the determination of the particular pathological condition present and

the selection of satisfactory procedures to correct those conditions. The efficiency of the gynecologist in his service to the patient depends, first, on his correct estimate of just what operative procedures are required in that particular case and, second, on his execution of those procedures accurately and expeditiously, without loss of time and without unnecessary tissue disturbance. The various operative procedures required have already been given under Technique of Operations. However, the author thinks that it will prove helpful to carry through in detail here, the handling of two cases, each typify-

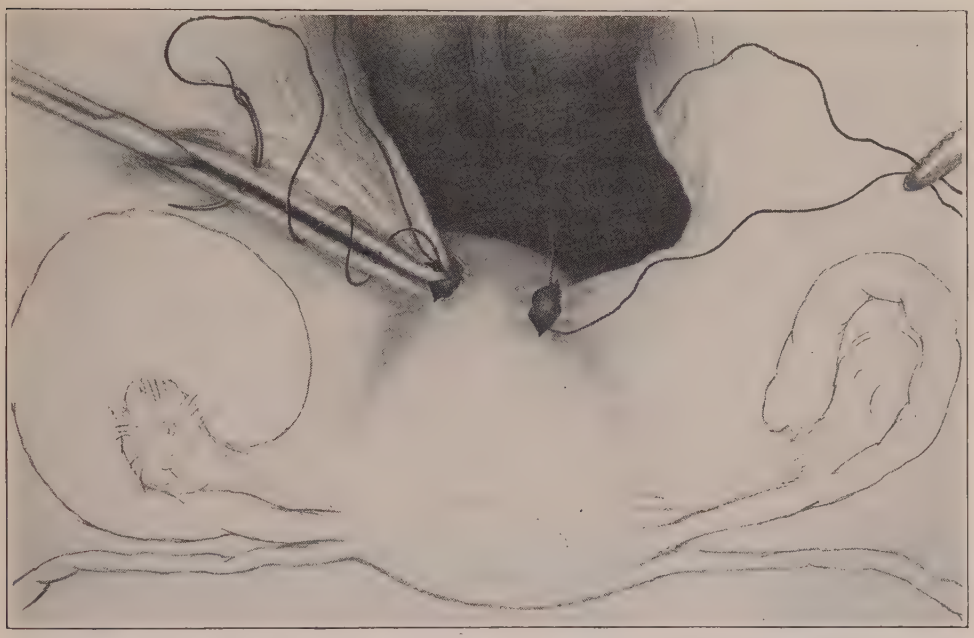


Fig. 218. Abdominal Combination Operation, Uterine Function Preserved. Shortening the utero-sacral ligaments. In the improved technique only one opening is made in the peritoneum—see Fig. 74.

ing a common combination of lesions—one requiring abdominal operation and the other suitable for vaginal operation.

1. *Abdominal combination operation.* The patient has a marked prolapse of the uterus and bladder with the usual exhausting symptoms, a definite tender adnexal mass (right) and some tenderness and occasional pains in the appendix region. She is in the childbearing period and the uterus is in condition to be preserved. It is somewhat enlarged from subinvolution but otherwise is practically normal for a multipara. There is no abnormal bleeding or discharge beyond what is accounted for by the circulatory disturbance from the prolapse, and there is no marked laceration of the cervix.

Such a case may be effectively handled by the following combination of operative measures:

a. The abdomen is opened and the utero-sacral ligaments shortened by the Young technique, as indicated in Fig. 218. The detailed technique of this operation is given in the preceding chapter (Figs. 69 to 80).

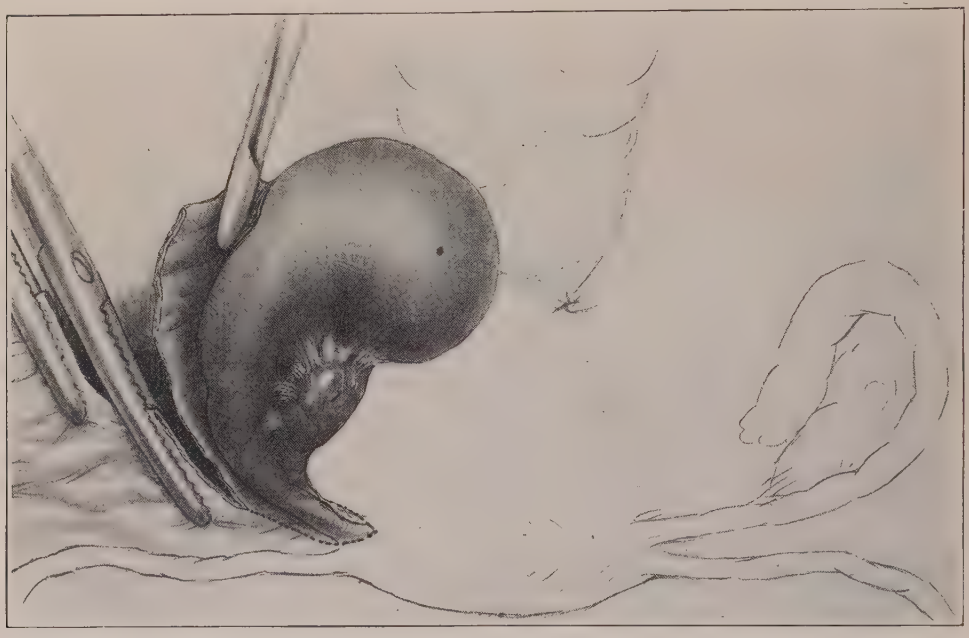


Fig. 219. Removing the diseased tube and ovary.

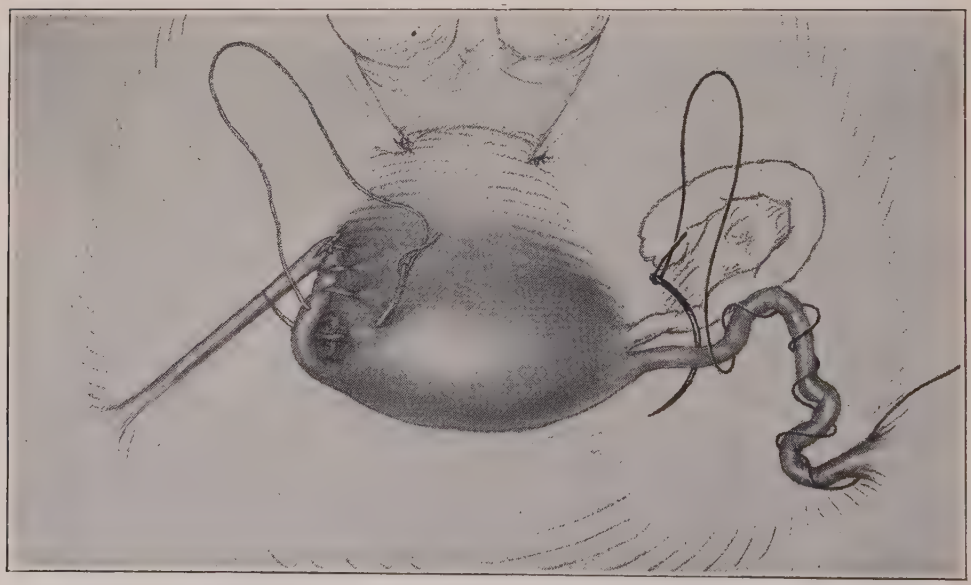


Fig. 220. Shortening the round ligaments. The right round ligament has been shortened by suturing it to the uterus over the tubo-ovarian pedicle, while the left is being shortened by the Long technique.

b. The diseased right adnexa are removed, as shown in Fig. 219.

c. The round ligaments are then shortened, the right by folding over the adnexal pedicle (Fig. 220) and the left by the Long technique (Fig. 220).

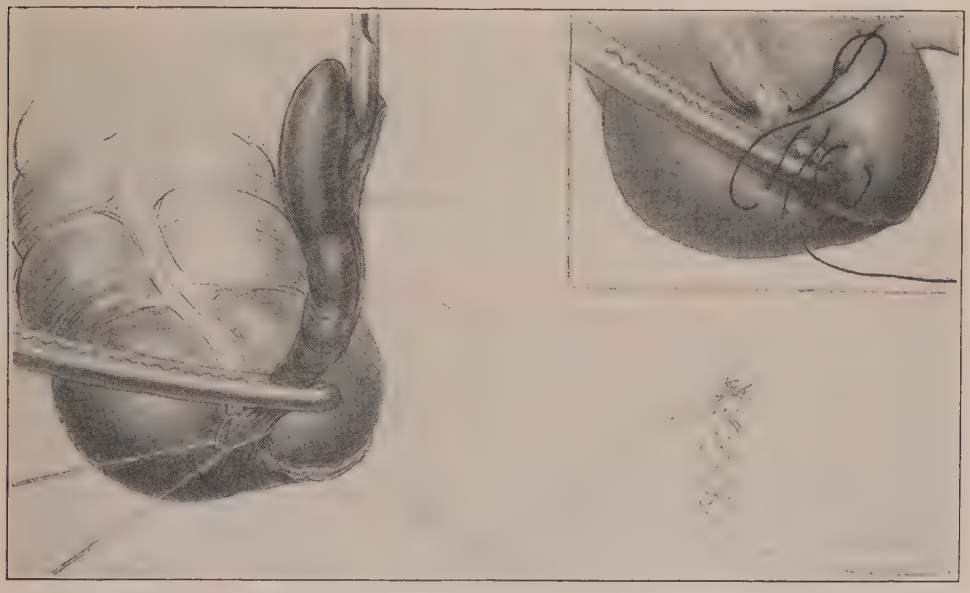


Fig. 221. Removing the diseased appendix. A convenient suture for burying the ligated stump of the appendix is shown in the insert at the upper corner.

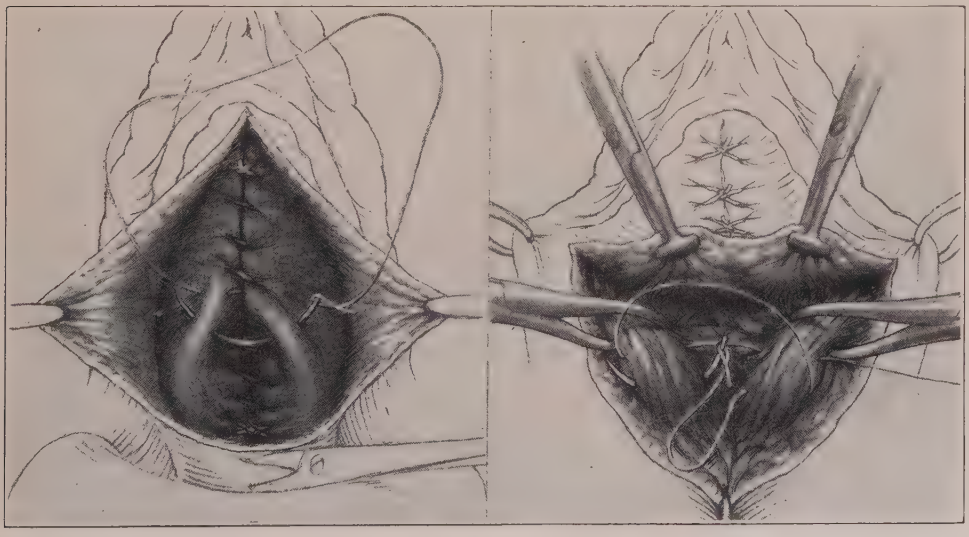


Fig. 222. Fig. 223.

Fig. 222. Repairing the utero-pubic fascia by the folding method.
Fig. 223. Repairing the relaxed pelvic floor.

Further details of each procedure are given in the preceding chapter (Figs. 36 to 44).

d. The appendix is removed. A very satisfactory technique is indicated in Fig. 221, the details for the suture for burying the stump being shown in the insert at the upper corner. This method of appendectomy is shown in detail in Chapter XII (Figs. 685 to 701).

e. The overstretched utero-pubic fascial plane is then repaired by plication sutures (Fig. 222). Further details of this are given in Figs. 188 to 192. If preferred, the stronger overlapping technique of Rawls (Figs. 193 to 199) may be used, but it takes more time and, in the experience of the author, is unnecessary in these cases handled by abdominal shortening of utero-sacral and round liga-

Fig. 224.

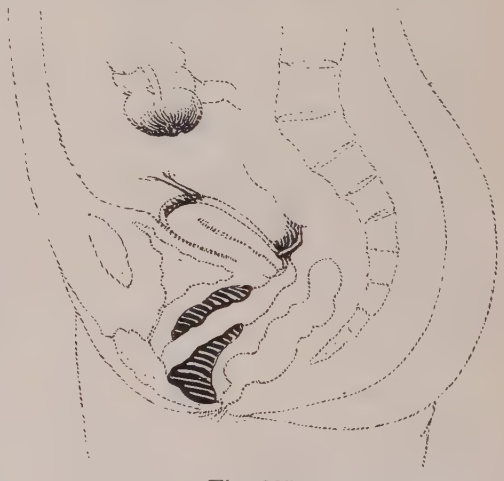


Fig. 225.

Fig. 224. A general view of the conditions to be corrected—relaxed pelvic floor, prolapse of the uterus and bladder, diseased right adnexa, and irritable appendix.

Fig. 225. The sites of operative work, indicating the structures involved in the work in this case. These are, in order, the utero-sacral ligaments, the right tube and ovary, the round ligaments, the appendix, the utero-pubic fascia and the pelvic floor.

ments. Polk prefers to repair the utero-pubic fascial plane from above, as shown in Figs. 186 and 187.

f. The pelvic floor is repaired (Fig. 223).

The above combination of operative procedures places the corrective measures exactly where most needed, hence the desired result is secured with the minimum of tissue disturbance. Fig. 224 gives a general idea of the conditions requiring correction—prolapsed uterus and bladder, relaxed pelvic floor, salpingo-oophoritis and a tender appendix. Fig. 225 shows at a glance the corrections made. To accomplish all this in a reasonable time requires accurate and rapid work. Though each procedure takes but a comparatively short time, unless the surgeon works expeditiously the whole series may easily extend the period of anesthesia beyond the danger point, and thus throw undue strain

on the vital organs. On the other hand, expedition must not be allowed to cover inaccuracy. The proper handling of such a case requires an operator who is well grounded in pelvic anatomy and pathology and experienced in pelvic operative technique. The patient's interests are conserved by such, but the patient's health and even her life are put in jeopardy by the attempt at a like operation by the imprudent amateur surgeon (still all too common) or by the developing embryo surgeon not yet sufficiently trained in pelvic pathology and technique.

2. *Vaginal combination operation.* When there are no disturbances requiring abdominal treatment or exploration, it is preferable as a rule to correct the prolapse of the uterus and bladder by a combination of vaginal operative procedures, about as follows:

a. The anterior vaginal wall is incised and separated from the bladder (Fig. 226). The bladder is separated from the uterus and pushed up, and the vaginal wall is cut sidewise at the cervix as shown in Fig. 226.

b. The sutures are placed for the shortening of the broad ligaments (Fig. 227). The details of such broad ligament shortening are given in Figs. 201 to 203.

c. The bladder is drawn up by a retractor and the anterior peritoneal culdesac opened (Fig. 228). Sutures are then placed which, when tied, will restore the vaginal attachment high on the cervix uteri (Fig. 229). All the sutures thus far used are left long and the ends caught in forceps, as indicated in the illustrations.

d. The round ligaments are shortened by being brought down and fastened to the vaginal wall, as shown in Fig. 230, and the culdesac is then closed by suture (Fig. 230).

e. The pelvic floor is repaired (Fig. 231).

There are variations of technique that may be employed, according to the preference of the operator or the special conditions to be met.

For holding the cervix backward and upward, instead of shortening the round ligaments the utero-sacral ligaments may be shortened. This may be accomplished by division and anterior fixation as shown in Figs. 108 and 109. If preferred, through the opening in the vesico-uterine peritoneal pouch, the corpus uteri may be brought down temporarily and the utero-sacral ligament shortened from within the peritoneal cavity as indicated in Figs. 136 and 137. The corpus uteri is later returned to the peritoneal cavity and the opening closed, after bringing down the round ligaments as in Fig. 230.

For restoring the subvesical support, instead of simple approximation suturing of the trimmed vaginal wall and fascia, the more extensive fascial overlapping method of Rawls may be used. This gives a stronger and more lasting support under the bladder and is decidedly preferable when the bladder prolapse is severe. The combination of the overlapping technique with the preced-

ing operative steps is indicated in Fig. 232. In the illustration the sutures for shortening the broad ligaments and for restoring the vaginal attachment high on the cervix are still untied, because all work requiring the cervix to be outside should be completed and the cervix pushed inside before these sutures are tied. In Fig. 233, the cervix has been pushed inside and the sutures tied, including the fascial overlapping sutures. The vaginal wall is then trimmed as needed and closed by interrupted sutures.

It is beginning to be recognized that prolapse of the uterus, involving as it

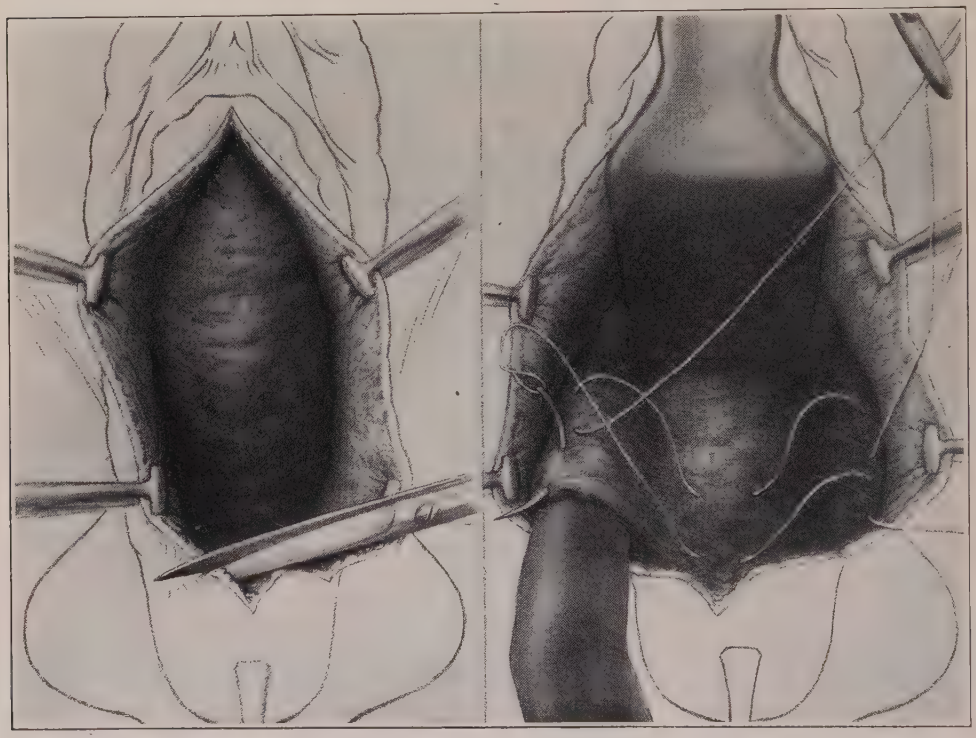


Fig. 226. Fig. 227.

Fig. 226. Vaginal Combination Operation, Uterine Function Preserved. The bladder has been separated from the utero-pubic fascia and the uterus, and the incision is being extended to each side to permit exposure of the broad ligaments.

Fig. 227. The broad ligaments exposed and sutures being passed for shortening the same.

does so many structures, requires a carefully considered combination of procedures for effective treatment. A hopeful sign of the times in this connection is furnished by the recent excellent articles by Ries (American Journal of Obstetrics, May, 1918), Watkins (Surgery, Gynecology and Obstetrics, May, 1918), Bissell (Surgery, Gynecology and Obstetrics, Feb., 1919), Ward (American Journal of Obstetrics, May, 1919), Spaulding (Surgery, Gynecology and Obstetrics, Dec., 1919).

II. Childbearing period. Function of pregnancy to be sacrificed. Even though the patient is in the childbearing period, it may be advisable to sacrifice the possibility of future pregnancy on account of one or more of the following conditions:

a. There may be some affection of the uterus itself, indicating its removal. The abnormality of the uterus may be due to scattered fibroid nodules or to deep-seated metritis with persistent discharge or to vascular disease with myopathica hemorrhagica or to sclerosis with hypersensitiveness (painful uterus).

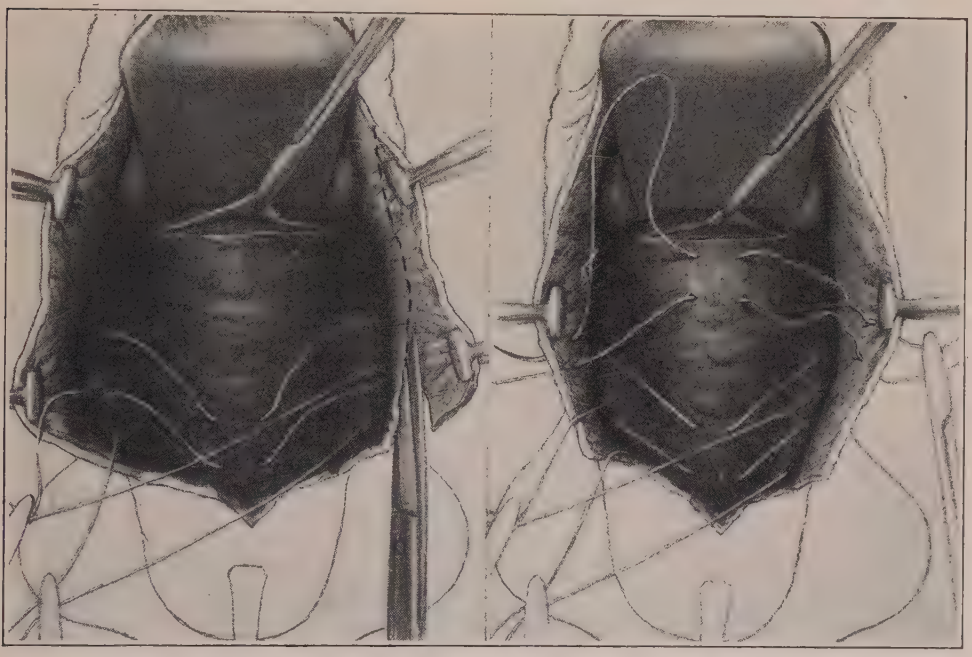


Fig. 228. Fig. 229.

Fig. 228. The sutures for shortening the broad ligaments are left long and caught with forceps. The vesico-uterine peritoneal pouch has been opened preparatory to shortening the round ligaments.

Fig. 229. Showing the sutures which fasten the vaginal wall and fascia up on the uterus to the level of the internal os. These also are left untied, the ends being caught with forceps.

These are, of course, only relative indications; the choice of hysterectomy depending on the disease, the age of the patient and her longing for future pregnancy.

b. The prolapse of the uterus and bladder may be so severe that the chances of permanent cure are problematical if the treatment is handicapped by the necessity of providing for a possible future pregnancy. The age of the patient is also an important factor to be considered. If the patient is past thirty-five, and particularly if she has several children, the preservation of

the childbearing function would not be nearly so important as in a younger woman.

c. The patient's general condition may be such that a prolonged abdominal or vaginal operation would carry too much risk. In such a case it may be advisable to employ some shorter and less severe procedure, such as the interposition operation with sterilization.

1. Abdominal hysterectomy. This is indicated when the examination through the abdominal incision shows the necessity for removal of the organ. The hysterectomy may be supravaginal, with fixation of cervical stump to pelvic pedicles

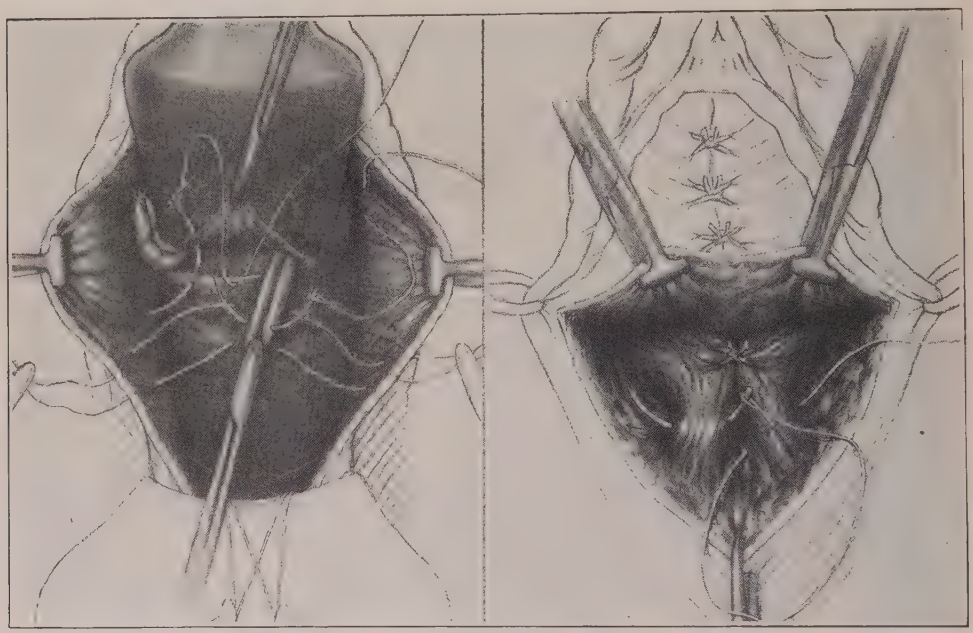


Fig. 230. Fig. 231.

Fig. 230. The round ligaments brought down and being sutured to the utero-pubic fascia. The peritoneal opening is then closed, and the sutures for shortening the broad ligaments are tied and cut short.

Fig. 231. The vaginal wall and attached utero-pubic fascia have been trimmed, and then approximated by interrupted sutures. The pelvic floor is being repaired in the usual way.

(Chapter VI) or to abdominal wall (Figs. 173 to 180) or the hysterectomy may be complete, with fixation of the vaginal stump to the pelvic pedicles (Chapter VI) or to the abdominal wall (Figs. 181 and 182).

2. Vaginal hysterectomy. If the diseased condition of the uterus is ascertained through vaginal exploration, the uterus is, of course, removed per vaginum. The hysterectomy may be complete, with high fixation of the vagina to the pelvic pedicles (Figs. 152 and 153) or with low fixation of the round ligaments beneath the bladder (Figs. 212 to 215). If preferred, the

hysterectomy may be partial, with fixation of the cervical stump beneath the base of the bladder (Figs. 147 to 151).

3. Interposition operation, with sterilization. The interposition operation with sterilization (Figs. 138 to 140) is advisable in those cases where the operative risk precludes prolonged abdominal or vaginal operation. With attention to details, the prolapse may be permanently corrected without prolonged anesthesia and with a minimum disturbance of tissue.

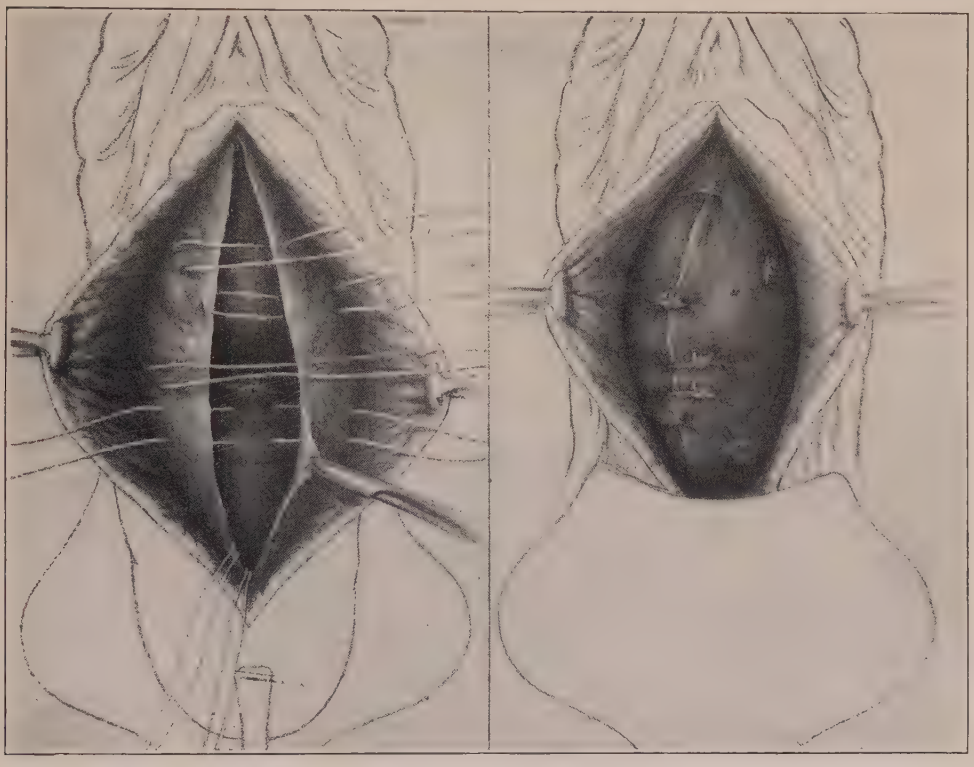


Fig. 232. Fig. 233.

Fig. 232. If preferred the utero-pubic fascia may be separated from the vaginal wall and overlapped by the Rawl's technique, as here indicated. In that case, the sutures for elevating the fascial attachment on the uterus are passed through the fascia only, as here shown.

Fig. 233. Sutures tied, completing the fascial overlapping. The vaginal wall is then trimmed and closed by interrupted sutures.

III. Childbearing period. Posterior culdesac hernia. Such a condition accompanying a severe prolapse, with the childbearing function to be preserved, can best be handled by abdominal operation—the hernial sac behind the uterus being securely closed, in addition to the usual procedures for the prolapse. If the prolapse is operated upon by way of the vagina, the posterior culdesac should be laid open and the cavity securely obliterated by sutures.

CHAPTER III.

CHRONIC INVERSION OF THE UTERUS.

From the time of Hippocrates, who wrote clearly of this condition, to the modern era, inversion of the uterus was treated principally by elevation of the lower part of the body and pressure on the protruding mass—that is, by posture and taxis. At first, posture seems to have been most emphasized, while later taxis, in its various forms, was more largely depended on.

In the long-standing cases, however, this treatment was only occasionally successful. Most of the women who survived the primary shock and the hemorrhage of the first few months, dragged out a miserable existence, and finally succumbed to anemia or chronic sepsis. The repeated and prolonged taxis, so persistently employed, often aggravated the symptoms and hastened the end.

As early as 50 B. C., Themison suggested amputation of the bleeding and sloughing corpus uteri, stating that he did not believe that the uterus was essential to life. One hundred and fifty years later the suggestion was put into practice by Soranus, who amputated a gangrenous uterus and the patient survived.* From that time on, amputation of the bleeding corpus uteri was the usual treatment in those cases which resisted nonoperative measures. In more recent years complete hysterectomy (per vaginam) was substituted, in the comparatively clean cases, for the simple amputation of the corpus uteri. At present hysterectomy seems to be the treatment most commonly employed in the long-standing cases. In some of these patients, particularly in those past the age of thirty-five, amputation or hysterectomy is the best treatment. In other patients, however, especially in younger women, sacrifice of the uterus is not the best treatment. In such patients, preservation of a functionating uterus is very important and may be attained through a conservative operation. It is this phase of the subject that the author wishes to emphasize.

Conservative operative measures, that is, measures for the reduction and preservation of the uterus in the cases that resisted pressure replacement, have been developed only within the last half century. Aran, in 1858, and Marion Sims a few years later, suggested incision of the fibers of the constricting cervical ring, but it is not certain that either of them actually used the method. The first recorded use of this treatment is by Robert Barnes, in 1861. In a case of inversion of six months' duration, he made three incisions in the constricting cervical tissues. The incisions extended deeply enough into the tense cervical ring to relax it, when taxis was applied and the inversion easily reduced. In this method, as used by Barnes and others, the peritoneal cavity was, of course, not opened.

*For the historical data here cited the author is indebted particularly to two excellent articles—one by Browne (American Gynecology, 1899) and the other by Peterson (American Gynecology, 1903).

On account of the danger of sepsis in those days, much care was exercised to avoid cutting through into the peritoneal cavity—hence the employment of multiple incisions, to avoid too deep cutting at any one point.

The next radical step was the attempt to stretch the constricting ring by means of a dilator introduced through a median abdominal incision. In 1869, Thomas reported a case so treated. He experienced great difficulty in executing the work in the friable infiltrated tissues of the long-standing inversion, and in a second case the attempt proved fatal. The method was exceedingly dangerous and only fairly successful, as indicated by failure in nearly half of the cases. In employing this method in 1899, Everke aided reduction by superficial incisions into the constricting ring from the peritoneal surface.

In 1883, Browne employed an equally effective and much safer method of dilating the constricting ring. He made an incision through the posterior wall of the inverted fundus uteri, into the inverted peritoneal pouch. Through this opening, about 1½ inches (4 cm.) long, a dilator was passed up into the constricting ring, which was then dilated. After careful and full dilatation, the uterine incision was sutured and then the inverted fundus uteri was replaced by taxis, if the ring had not already recontracted so much as to prevent replacement.

Küstner (1893) made a long incision in the posterior uterine wall, from near the fundus to near the external os. He first opened the posterior culdesac by a wide transverse incision, broke up any adhesions present and then incised the posterior uterine wall as just mentioned.

Following a suggestion by Piccoli in 1894, Morisani, in 1896, extended the incision up the posterior wall through the external os, thus giving complete division of the posterior uterine wall, which facilitated reduction in the old cases with infiltrated sclerotic walls.

Spinelli, a few years later, incised the anterior vaginal vault, opened the vesico-uterine peritoneal pouch, and then divided the anterior uterine wall from the external os to the top of the inverted fundus. This anterior division gives as much facility in reduction in difficult cases as the posterior division; and, being anterior, it possesses certain distinct advantages.

Haultain, in 1901, attacked by the abdominal route an inversion of nine months' duration; but instead of depending on dilatation of the ring, as did Thomas, Haultain incised the constricting ring posteriorly. The incision was gradually extended in the corpus uteri, as more and more of the inverted portion was pushed up within reach, until finally reposition was effected. The replaced uterus presented a posterior incision about 1½ inches (4 cm.) in length, which was securely sutured from the peritoneal surface. The patient made a rapid recovery.

A few years later, Dobbin employed anterior incision of the constricting ring. It was a recent inversion complicated by sepsis. Taxis failing, he opened the abdomen and endeavored to dilate the constricting ring after the method of Thomas. This failed completely. Then an incision was made in the anterior

margin of the inversion funnel. This passed through the entire thickness of the uterine wall and was extended sufficiently to permit replacement of the corpus uteri. The patient died some days later of the progressive sepsis.

Résumé of Conservative Operations.

In brief the operations for the reduction of an inverted uterus have been as follows:

1. Multiple incisions into the constricting cervical ring, per vaginam, (Aran, Sims, Barnes, 1861).

2. Dilatation of constriction-ring by dilator introduced through an abdominal incision (Thomas, 1869; with incisions, Everke, 1899).

3. Dilatation of constriction-ring by dilator introduced through incision in fundus uteri, per vaginam, (Browne, 1883).

4. Division of constriction-ring and adjacent uterine wall and cervix, posteriorly, per vaginam, (Küstner, 1893).

5. Complete division of posterior uterine wall and cervix, per vaginam, (Piccoli, Morisani, 1896).

6. Complete division of anterior uterine wall and cervix (Spinelli, 1900).

7. Division of the constriction-ring posteriorly through an abdominal incision (Haultain, 1901).

8. Division of the constriction-ring anteriorly through an abdominal incision (Dobbin, 1905).

Vaginal operation is by far the safer plan. Complete division of the anterior wall of the cervix and corpus uteri (Spinelli method) is altogether the most satisfactory method and the one the author would strongly recommend in long-standing cases.

Technique of Spinelli Method.

The details of the method are conveniently shown by describing a case operated upon by the author. The case (reported in Jour. A. M. A., Vol. 62) is of interest also because of the seriousness of this affection and its extreme rarity.

Mrs. B., aged 23, operated on February 7, 1913, for complete inversion of the uterus, of a year's duration, had been delivered of her first child February 2, 1912. The labor was normal except for adherent placenta, which was removed manually. There was free bloody discharge and much cramping pain, which became less after six weeks. Bloody discharge continued off and on during the summer. The patient, though weak, nursed the baby and was up and about most of the time. In the fall the bleeding became worse and finally, in the winter, the patient consulted Dr. H. S. Brookes, who examined her and made a diagnosis of inversion of the uterus. When the author saw the patient, in consultation with Dr. Brookes, she was weak from chronic loss of blood, and presented the exsanguinated, waxy appearance so characteristic of profound anemia.

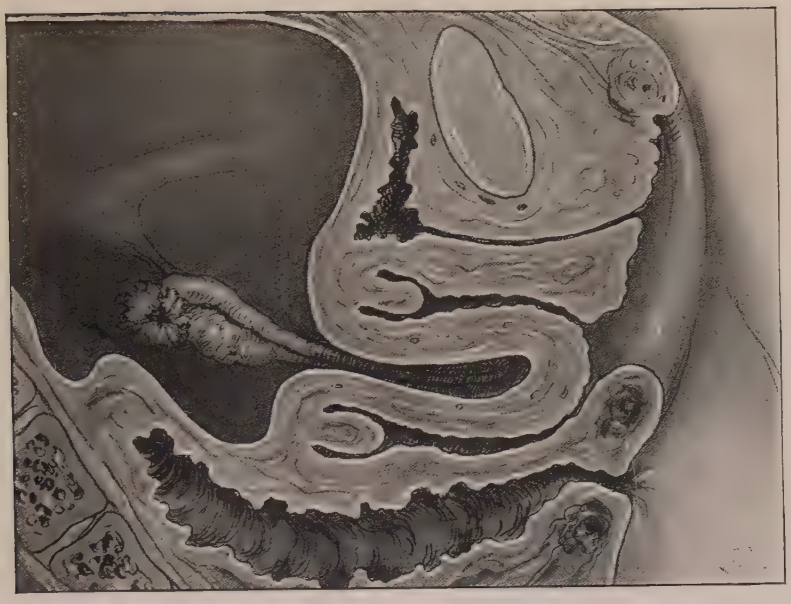


Fig 234. The inverted uterus, showing the changed relations.

Fig. 235. Beginning the operation for reposition (Spinelli method).

After preparatory treatment, to improve the patient's condition as far as possible, the inversion was subjected to operation by the Spinelli method, as follows:

1. After disinfection of the vagina and inverted corpus uteri, the anterior vaginal fornix was incised and the bladder separated from the uterus (Figs. 234, 235 and 236). The vesico-uterine peritoneal pouch was then opened and the opening was widened laterally by the fingers, thus exposing the inversion funnel, as shown in Fig. 237. Here there were numerous adhesions binding together the peritoneal surfaces, but the adhesions were easily separated.

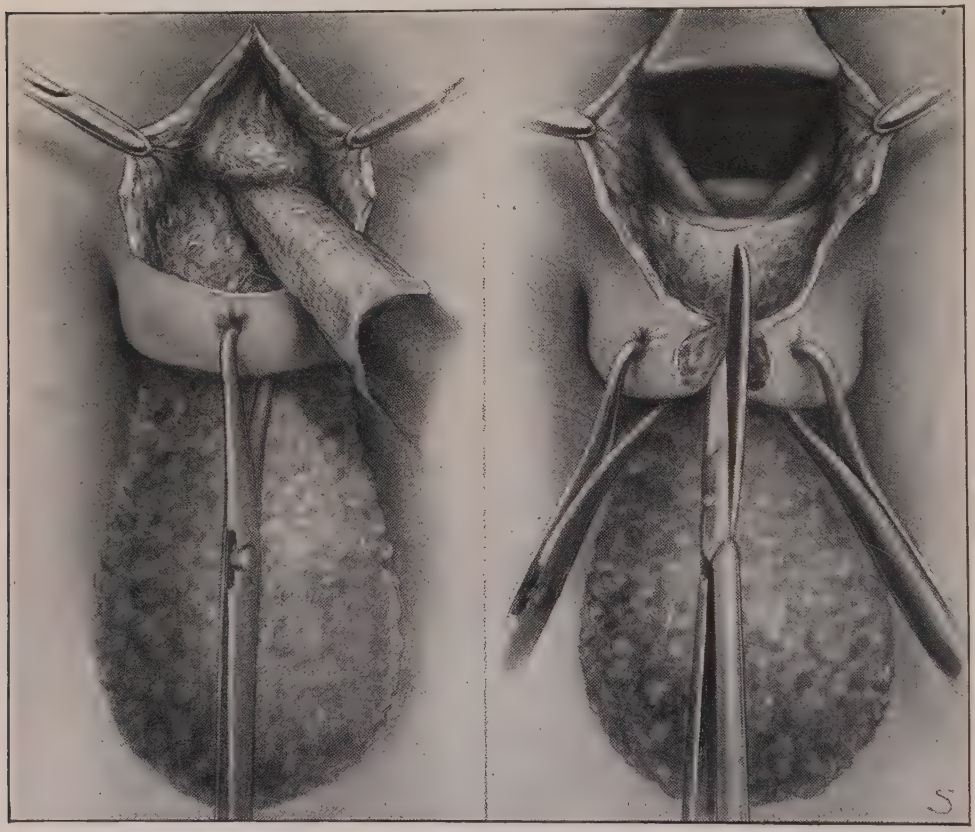


Fig. 236. Fig. 237.

Fig. 236. Separating the bladder from the cervix.

Fig. 237. The peritoneum opened, exposing the inversion funnel. Division of the cervix begun.

2. The cervix was then divided anteriorly up to the constricting ring (Figs. 237 and 238), and the incision was continued down the anterior wall of the corpus uteri (Figs. 238 and 239). At various stages of the incision the attempt was made to turn the uterus inside in, but this could not be done until the incision was extended to the fundus.

3. The mucous surface of the uterus was then turned in by hooking the fore-fingers into the incision and rolling the peritoneal surface out while the two

thumbs, making counter-pressure, indented the mucous surface and pushed it in, as indicated in Figs. 240 and 241. Considerable stretching of the shrunken and infiltrated peritoneum was necessary at this stage of the work.

4. The thickened uterine wall was then trimmed away sufficiently to permit approximation of the peritoneal portion of the uterine incision. The turned-out endometrium and adjacent muscular wall had become greatly infiltrated and thickened, and consequently a considerable portion of this wall, amounting to

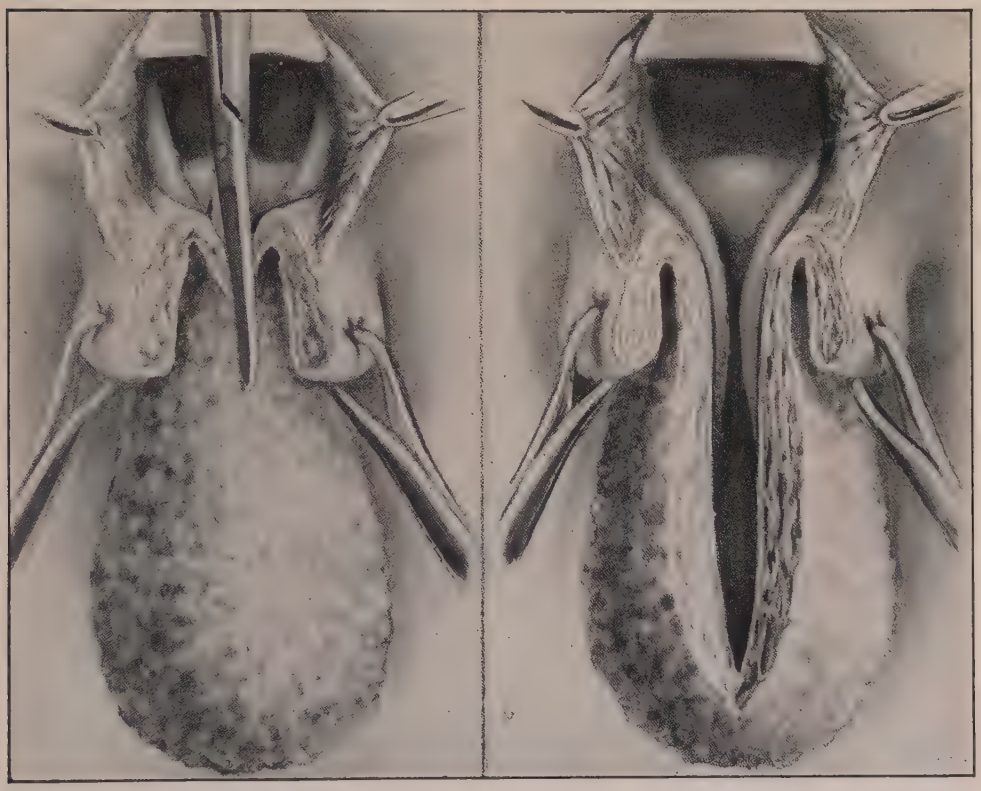


Fig. 238. Fig. 239.

Fig. 238. Cervix and constriction-ring divided, and the incision being extended down the inverted corpus uteri.

Fig. 239. The incision extended to the fundus, as found necessary for reposition.

about one-fourth of the entire uterus, had to be cut away as indicated in Fig. 242. This reduced the bulk of the uterus so that the shrunken peritoneum could be approximated around it.

5. The incision in the uterus was then closed by deep and superficial sutures (Figs. 243 to 246). The deep sutures (Fig. 243) included most of the thickness of the muscular wall, but missed the endometrium and the peritoneum. Over these deep sutures and burying them, was placed a superficial suture (Fig. 244)

which approximated the peritoneum, care being taken to fold in the peritoneal edges.

6. Drainage was instituted. Free drainage is important in these cases because the chronically infiltrated and infected uterine wall cannot be wholly disinfected, and hence the incisions and manipulations spread contamination about the field. Marked absorption and fever for some days after operation is the rule in these cases, and in some cases the temperature is alarmingly high and persistent.

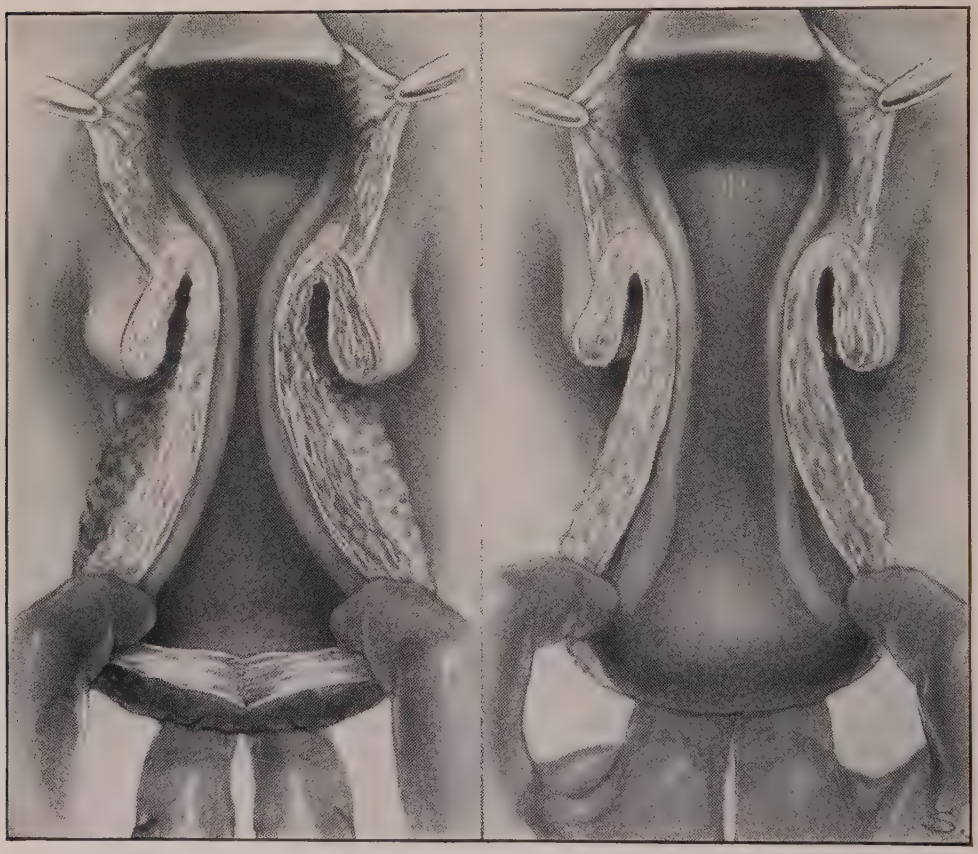


Fig. 240. Fig. 241.

Fig. 240. Turning the uterus inside in again. First step.

Fig. 241. The turning almost completed. Peritoneal surface becoming external and mucous surface becoming internal.

In this case tube-drainage was employed posteriorly, through a culdesac opening (Fig. 247), and a rubber-tissue drain anteriorly. In a similar case the author would now use a tube-drain anteriorly as well as posteriorly (Fig. 247), to afford immediate exit to any contaminated fluid that otherwise might accumulate in the vesico-uterine peritoneal pouch.

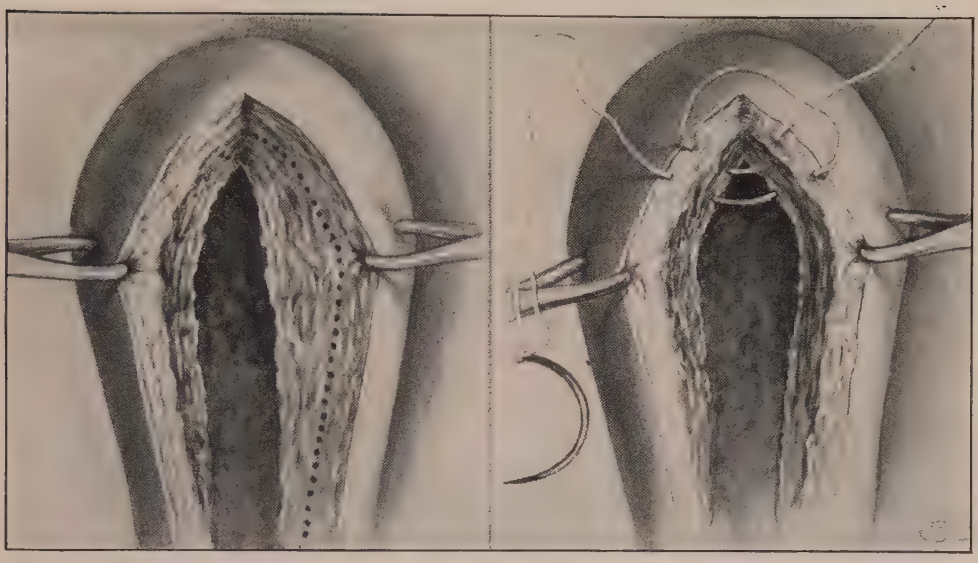


Fig. 242. Fig. 243.

Fig. 242. Turning completed. Dotted line indicates the portion it was necessary to excise on each side, to permit approximation of the peritoneal edges.

Fig. 243. Closing the uterine incision. One of the deep sutures for the muscular portion.

Fig. 244. Fig. 245.

Fig. 244. Closing the uterine incision. The superficial suture for the peritoneal portion.

Fig. 245. Closing the cervical incision.

7. The vaginal-section opening was closed, with drainage, and a vaginal packing put in to keep the cervix well back and the fundus forward. It is important to take steps to keep the uterus forward during the healing process. If the tendency toward backward displacement is marked in the replaced uterus, it should be fastened forward by one of the vaginal operative methods. If there is no special tendency backward, a packing or pessary for some days will be sufficient.

Following operation, the patient had considerable fever. The first day the temperature was 103° F., the second day 102.4, the third day 102.6.

This persistent fever was of course disquieting, on account of the possibility of a spreading peritonitis or of generalized venous infection (pyemia). These dangers had been taken into account when deciding to save the uterus, and it

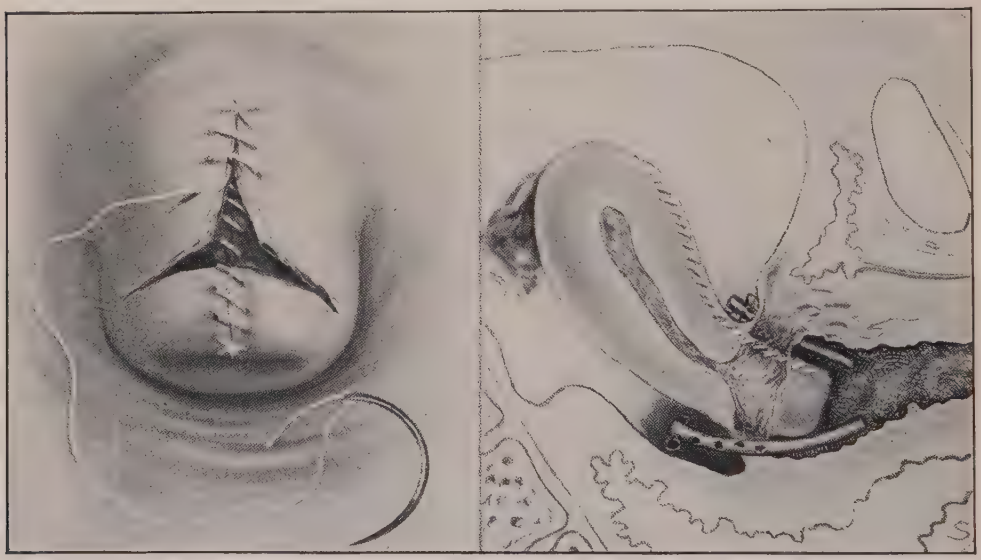


Fig. 246. Fig. 247.

Fig. 246. Closing the vaginal incision.

Fig. 247. Free drainage. Tube-drain in the posterior peritoneal pouch and in the anterior peritoneal pouch.

had then been determined that if serious infection developed after operation vaginal hysterectomy would be done to remove the infected organ and establish free drainage. It looked for a time as though a serious infection might be developing, but it did not develop. The fever was the only disturbing symptom. There were no evidences of serious peritoneal irritation, so it appeared safe to wait. The fever gradually subsided in the course of ten days, and the subsequent convalescence was uninterrupted.

The high temperature was probably an absorption-temperature, due largely, if not entirely, to the disturbance of the infiltrated uterine wall. There was not only an incision through the infiltrated wall but also a general shifting of the

relation of the elements of the wall by the forcible turning of the uterus inside in again. That this general shifting of the elements of the wall is an important factor is indicated by the fact that marked rise of temperature has been noted in cases of reduction by taxis without incision.

The patient gained strength rapidly, iron of course being given to overcome the marked anemia due to the previous chronic blood-loss. Menstruation began in April, the second month after the operation, and has been regular since. The first two or three times the flow lasted only two or three days and was scanty. Since then it has been normal—from three to four days and a good flow, but not excessive. The patient states that the menstruation is the same now as it was before she became pregnant, except that the pains she formerly had do not now appear. The general health is good and the patient feels well and strong and is as active as ever. On examination recently, the uterus and other pelvic organs appeared practically normal.

The advantages of the Spinelli method are the following:

1. Being vaginal, it minimizes the amount of peritoneal contamination, a most important consideration when dealing with an infected structure.

2. As the reposition is accomplished by incision, there is not the bruising and perforation of the friable uterine wall which has so often accompanied attempted reposition by dilatation of the constriction ring.

3. Division of the anterior uterine wall is preferable to division of the posterior wall, because the work is thus more easily and accurately accomplished. The anterior uterine wall and anterior fornix lie toward the operator, and hence are less deeply situated and more easily reached. Again, when the operation is anterior, the bladder may be lifted away, giving a wide space for investigation of the inversion-funnel and of the various pelvic structures, and also more room for the operative manipulations of incision, reposition and suturing. Again, if there is a marked backward tendency, effective forward fastening of the uterus may be carried out through the anterior incision. Again, a suture-line on the posterior surface of the uterine wall extending to the fundus is more likely to form troublesome adhesions—to the intestines, leading to obstruction, or to the posterior pelvic wall, leading to adherent retrodisplacement.

The points in favor of the posterior incision are that it eliminates the extra opening for drainage and that the sacro-uterine ligaments may be more conveniently shortened; but these minor advantages of the posterior incision are outweighed by the more important advantages of the anterior incision.

CHAPTER IV.

PELVIC FLOOR RELAXATION AND FISTULAE.

RELAXATION OF THE PELVIC FLOOR.

For this common gynecologic condition, so frequently requiring operation, the author prefers the term "relaxation" rather than "laceration," for the following reasons:

a. It is the presence or absence of relaxation that determines the necessity for treatment. Even though there is immediate repair and perfect healing of the laceration there may, through subinvolution and lack of tone, be persisting relaxation requiring operation. Again, with an unrepaired laceration, the contraction of scar-tissue and regaining of tone may be sufficient to give good support, and there is no relaxation—hence, no cause for operation. The essential lesion, then, considered from the therapeutic standpoint, is the relaxation.

b. The term "laceration" as commonly used, and as interpreted by the patient, often works an injustice to the physician who took care of the patient during confinement. In a considerable proportion of cases the patient comes to the gynecologist with her mind poisoned against her former physician because some other physician has told her, bluntly and without qualification, that her present trouble is due to having been "torn in labor." The average patient interprets this as conclusive evidence of faulty care. In fact, she not infrequently begins her story with the statement that her trouble is due to neglect in confinement—this she knows because of having been informed that she was suffering from "a laceration."

Now as a matter of fact, this wholesale condemnation is not warranted. Of course, in some cases the relaxation, for which the patient seeks relief, is really due to the fact that an extensive tear was not repaired at all or was repaired in a faulty manner. However, in a considerable proportion of the cases, the relaxation is due to entirely different causes. There may have been no open laceration, the overstretching having been accomplished by submucous lacerations (many or few) which could not even be located, much less repaired. Again, if pelvic floor involution is imperfect, as it often is in atonic patients, marked relaxation may result without there having been any definite lacerations, either open or submucous. This form of relaxation is especially apt to occur if the patient has repeated pregnancies at short intervals. Again, in certain cases, laceration or division of tissue must necessarily accompany delivery of the child. The wounds may fail to heal satisfactorily in spite of the utmost care. Again, a pelvic floor which is good two months after labor may be found greatly relaxed later, owing to displacement of the uterus or to heavy lifting (as of a heavy child) or to per-

sistent straining or coughing associated with an atonic condition of the tissues. These facts are well known to every physician who has made a real study of the anatomy of the pelvis and of the physiology and pathology of parturition.

In view of the above facts, it is incumbent upon us to employ some term, for the condition under consideration, which does not in itself carry condemnation to the mind of the patient. "Relaxation" is such a term. It simply designates clearly the condition demanding relief, leaving open the question as to which one of the above mentioned causes may have been present in that particular case.

OPERATIVE METHODS.

The treatment of relaxation of the pelvic floor consists in taking up the slack, so that the pelvic sling is sufficiently shortened, and in restoring the perineal body, so as to carry the weak place in the pelvic floor (the vaginal opening) forward, out of the line of direct pressure.

The pelvic sling, the strong supporting part of the pelvic floor, consists of the levator ani muscles and the fascia above and below (Figs. 115, 116). This musculo-fibrous sling or diaphragm is the structure worked upon in repair of the pelvic floor. Shortening of this sling restores the pelvic floor support, while if there is no shortening of the sling, there is no lasting restoration of support.

As operative treatment of this condition deals principally with one structure (the pelvic sling), there is not the confusing multiplicity of radically different operations found in the treatment of uterine retrodisplacement and prolapse, where many different structures may be utilized for support. For restoration of the pelvic floor there is just one up-to-date operation and its essentials are (a) exposure of the musculo-fibrous sling by incision through covering mucosa or skin, (b) shortening of the sling and coaptation of the perineal tissues, and (c) closure of the wound in the superficial tissues. The incision through the vaginal mucosa or perineal skin is simply to allow access to the deeper and more important structures. It corresponds to the incision through the abdominal wall in abdominal work. The pelvic floor is "opened" to allow access to the real supporting structures, and when they are repaired the opening is closed.

There are variations of technique in the different steps, particularly in the opening and closing. The methods of opening and closing the pelvic floor differ so much that one may be inclined, on first thought, to class them as radically different operations. A closer study, however, will show that the really important feature, the approximation of the muscles and fascia between the vagina and rectum, remains practically the same. Also, there are slight variations in suturing and in approximation of the deep tissues, but these are only minor differences. For a time a radically different method of shortening the levator sling was in use. This consisted in excising a portion of the sling on one or both sides and approximating the cut edges, as indicated in Fig. 277. This proved useful, for it demonstrated and emphasized that the shortening of the sling was the im-

portant thing. It was found, however, that the necessary shortening could be more easily and more effectively accomplished by subvaginal approximation of the sides of the musculo-fibrous sling. This is a physiological but not an anatomical restoration of the pelvic floor. In fact, anatomically it is a marked distortion of the parts in that it throws the main supporting sling between the vagina and rectum instead of back of the rectum as it is normally. Much energy and good paper have been wasted in arguing for a perfect "anatomical" restoration of the pelvic floor—that is, a restoration exactly "as nature made it." The operation under consideration has been lauded as such, but it is not. However, it gives support, relieves the symptoms and enables the patient to pursue her activities in comfort, which, after all, is the ultimate result sought.

This effective and satisfactory operation did not arise complete at once. It was of slow growth, and reached its present perfection through the pioneer work of many men through many decades. In the fifty years prior to 1880, much work was done in repair of the pelvic floor, but it was practically confined to excision of portions of the vaginal mucosa and suturing of the resulting wounds. Emmet, in his epochal work in the early eighties, pointed out the necessity of reaching and uniting the deeper structures of the pelvic floor. His "butterfly" denudation exposed the injured area in each lateral sulcus, and he insisted that the sutures be passed so as to include the deep tissues of the sides of the sulcus. The importance of this point was partly obscured by the emphasis placed on the form of denudation, which seemed to fill the eye of operators. Much ingenuity was displayed in devising forms of denudation. Later it came to be recognized that it was not the form of denudation but the inclusion of the deeper tissues in the sutures that determined the permanency of the result. Soon it was appreciated that the best result was secured by a definite shortening of the levator ani muscles with the associated fasciæ. There were two methods of shortening this musculo-fibrous sling. It could be shortened by lateral excision or folding, or by approximation of the two sides of the sling between the vagina and the rectum. Various methods were proposed for exposing the sling and for shortening the same, and "new" operations for restoration of the pelvic floor appeared in great number. Reduced to the essentials, however, each new operation fell into one or the other of the two classes mentioned—that is, the sling was shortened by lateral excision or folding or it was shortened by median approximation between the vagina and the rectum. After prolonged trial it was established that the latter method was the preferable one. This accomplishes the desired object most effectively and in the simplest way. Consequently the other method (lateral excision or folding—Figs. 276 and 277) has dropped out of use, and may now be classed among the "former operations."

Subvaginal approximation of the sides of the pelvic sling remains, then, the one advisable operation for repair of the pelvic floor. Among different operators there are decided differences in regard to minor details, as previously explained. But the essential features are generally recognized and usually followed.

As to whom credit is due for the various steps in the development of this operation, a full exposition of that would require a detailed historical review of such length as to be out of place here. The primary impetus to the inclusion of deep tissues came principally from the splendid work of Emmet. In later pioneer work, Hegar and Tait were prominent. The Tait method of denudation by raising a flap (so-called flap-splitting) is, with modifications, the method now most generally employed for opening the pelvic floor.

The later work with the deep structures developed gradually as the result of suggestions by a large number of operators, each contributing somewhat to the general advance. The perfected operation is not due to any one person but to many, and the author hesitates to single out individuals on account of possible injustice to those not mentioned. However, it may be stated that, as far as the author has noted, shortening of the musculo-fibrous sling by definite exposure and excision laterally, was first described by Harris in 1897 (Jour. A. M. A.). In the same year a method of subvaginal approximation of the sides of the sling was described by Noble (Am. Gynec. and Obstet. Jour.). Since then the technique has been perfected by useful suggestions from many contributors.

TECHNIQUE OF OPERATION.

The various phases of technique will be presented in the following order:

Regular operation, according to the technique considered by the author most satisfactory.

Variations in technique.

Laceration through the sphincter ani.

Steps in Regular Operation.

1. Planning the restored vaginal opening. By careful examination of the vaginal entrance, the opening of the duct of the vulvo-vaginal gland may be identified on each side. Just below this on each side, at the point marked (x) in Fig. 248, the tissue should be caught firmly with the tenaculum-forceps or other holder. To determine if repair to this point will leave a vaginal opening of proper size, the forceps may be crossed and the sides brought together, as shown in Fig. 249.

Care should be taken to keep sutures and scar-tissue from the immediate vicinity of the vulvo-vaginal glands. If this duct on either side is included in the operation area, it is likely to give rise to a hypersensitive and troublesome scar and may result in definite cyst formation.

2. Opening the pelvic floor. The incision extends from one forceps to the other (Fig. 253). It should be placed well within the vagina as indicated by the dark line in Fig. 248. When so placed it is farther removed from the rectum, and hence from infection, and is in tissue less sensitive than the perineal skin. The incision may be conveniently made with the scissors as

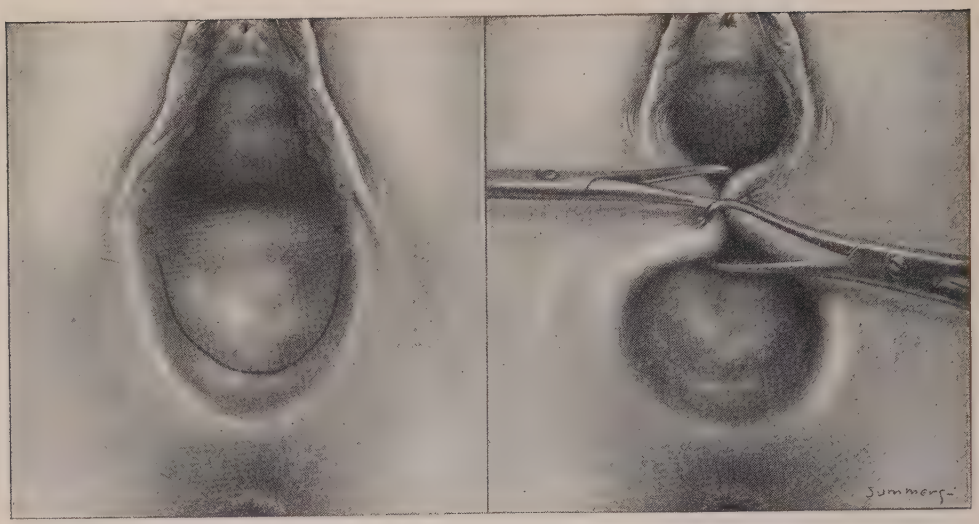


Fig. 248. Fig. 249.

Fig. 248. The location of the incision for opening the pelvic floor. The author prefers to place the incision well within the vaginal opening, as indicated by the heavy black line. The cross (x) on each side indicates the area to be caught by the forceps. This marks the end of the incision, and is situated on each side just below the opening of the vulvo-vaginal gland.

Fig. 249. Estimating the size of the repaired opening, by bringing together the extremities of the intended incision.

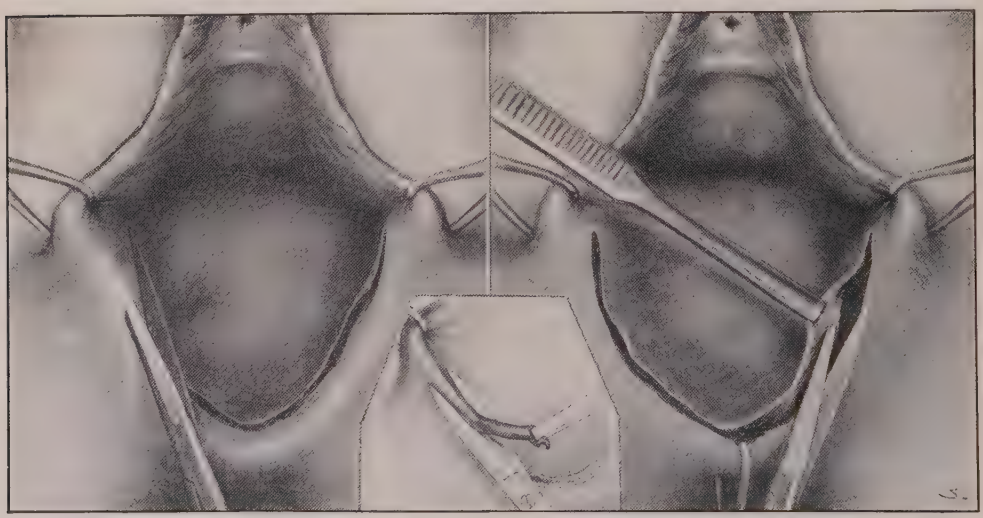


Fig. 250. Fig. 251. Fig. 252.

Fig. 250. Opening the pelvic floor with sharp-pointed scissors.

Fig. 251. Another method of opening the floor with scissors.

Fig. 252. Freeing the edge of the vaginal flap, preparatory to catching it with forceps.

shown in Fig. 250. If preferred, the line of tissue may be made tense and then clipped off with the scissors as shown in Fig. 251, or the tense line of tissue may be excised with a knife.

After the incision is made, the margin of the flap is bared by knife or scissors, as indicated in Fig. 252, and then caught with a T-forceps (Fig. 253). With the

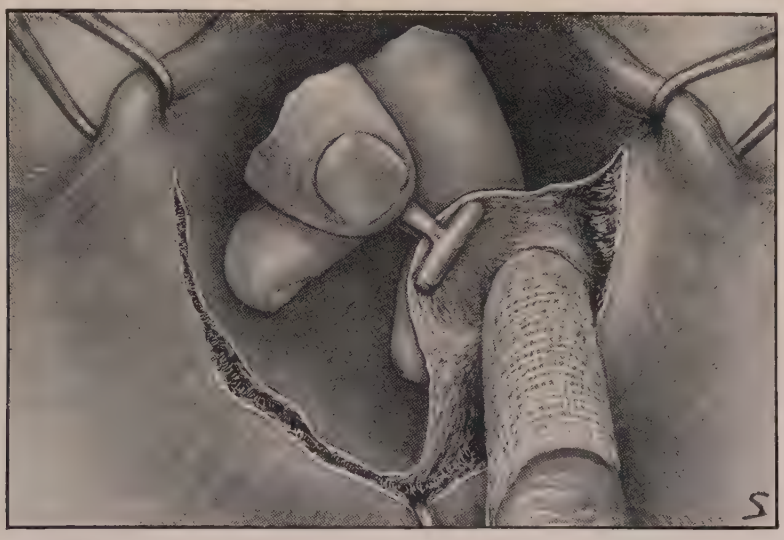


Fig. 253. Rolling off the underlying tissues from the vaginal wall with the gauze-covered finger. The motion is that of a push and a roll combined, and is made against the left forefinger which furnishes the counter-pressure. The fingers are shown ungloved for better identification and appreciation of relations. They are of course gloved in the work.

Fig. 254. The flap raised on the left side, showing the pelvic sling exposed in the depth of the wound.

gauze-covered finger the underlying tissues are quickly rolled off the vaginal flap sufficiently to expose the deep musculo-fibrous sling (Fig. 254). The same step is then carried out on the other side. In this separation of the tissues from the vaginal flap, if there is much scar-tissue it may be necessary to divide it at some points with the knife or scissors.

Care must of course be exercised, to avoid opening into the rectum. The layer of veins constitutes the guide to safety. As long as the line of cleavage is kept between these veins and the vaginal wall, the rectum is safe. On the other hand, when the veins are permitted to remain on the vaginal flap, the line of cleavage is going too deeply and a hole may be torn into the rectum at any time.

3. Identification and isolation of the musculo-fibrous sling. When the vaginal flap is raised sufficiently, the smooth surface of the sling may be seen (Fig. 254). When exposed on both sides, the sutures may be passed through the tissues in that situation under the guidance of the finger. The author prefers,

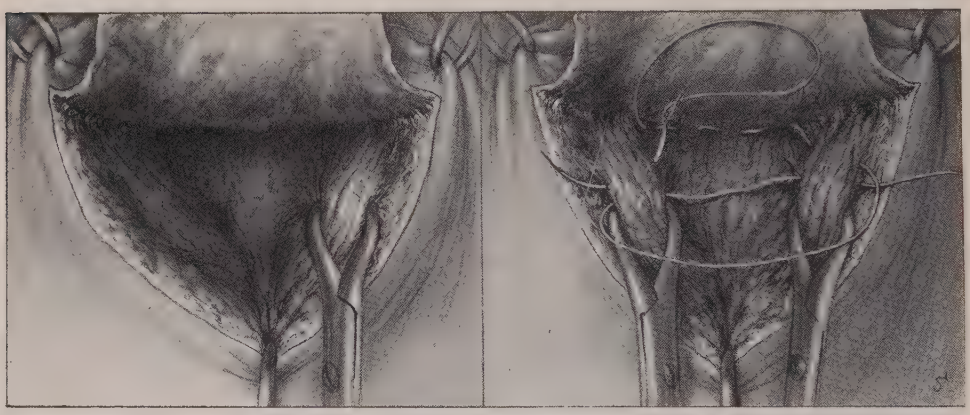


Fig. 255. Fig. 256.

Fig. 255. The sling surface caught with forceps and brought out, for better identification and more accurate passing of the sutures.

Fig. 256. The first approximation suture passed. It is well to make two rounds with the suture before tying.

however, to catch the sling on each side in a tenaculum-forceps and draw it well into view, as shown in Figs. 255 and 256. By this means the tissues are more positively identified as part of the pelvic sling and the sutures may be placed more accurately.

4. Approximating the sides of the sling. The exposed sides of the sling are fastened securely together by sutures, as indicated in Figs. 256 and 257. It is well to pass the suture twice, as shown in Fig. 256, so that there is a double suture or two rounds to each knot, each round of the suture including a somewhat different portion of the pelvic sling. Too many knots increase the chances of irritation and suppuration. When one suture has been passed and tied, it may be left long to serve as a tractor (Fig. 257) and the tenaculum-forceps may then be removed.

The sutures should not be too tight. There will be considerable reparative swelling of the tissues, and if the tissues included in the sutures are firmly constricted to start with, there may be sloughing. The sides of the musculo-fibrous sling should be approximated over a broad area, so as to secure a firm, broad union. Two or three sling sutures are usually sufficient. Before placing other

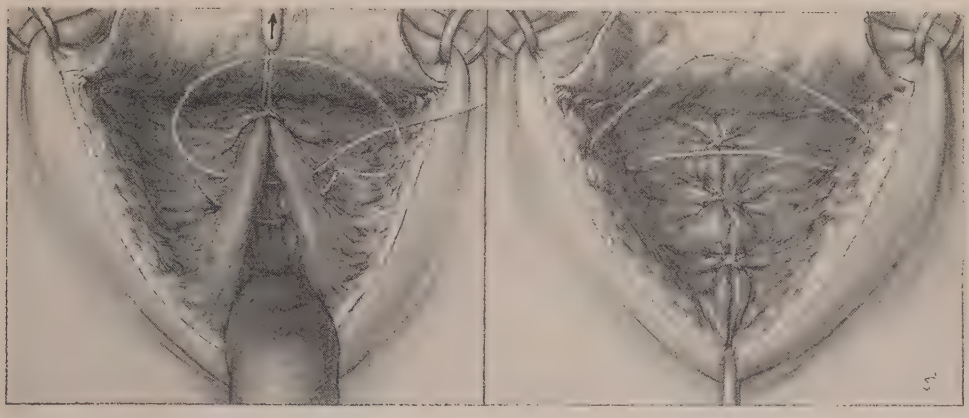


Fig. 257. Fig. 258.

Fig. 257. Placing the lower sutures in the sling. Traction on the first suture causes the lower tissues to stand out so that they can be easily picked up with the suture, as here shown.

Fig. 258. The sling sutured, and more superficial sutures being passed.

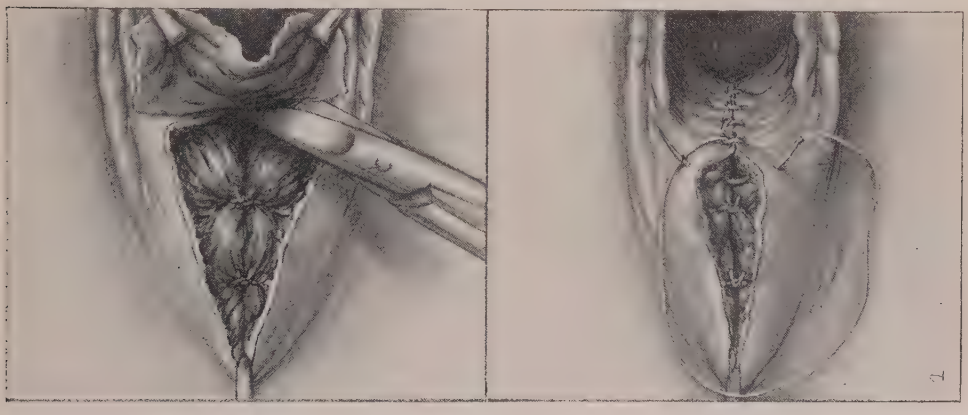


Fig. 259. Fig. 260.

Fig. 259. Trimming off the excess of vaginal wall.

Fig. 260. The vaginal portion of the wound closed, and the perineal portion being sutured.

sutures, let the flap drop and test the size of the vaginal opening by introducing three fingers. At this stage of the operation, the opening should admit three fingers easily. It is narrowed considerably by the further steps of the operation and by the subsequent scar-contraction, and if smaller than three fingers at this time, it is likely to cause trouble in coitus.

Having completed the approximation of the sides of the sling, the more superficial tissues of the perineum are united by sutures as desired (Fig. 258).

5. Closing the opening in the pelvic floor. The excess of vaginal wall is trimmed away, as shown in Fig. 259, and the vaginal wound is closed as indicated in Figs. 260 and 261. If the excess of vaginal wall is not trimmed away, it is likely to form tags and irregularities which may prove troublesome afterward. The suture which closes the upper angle of the vaginal flap should

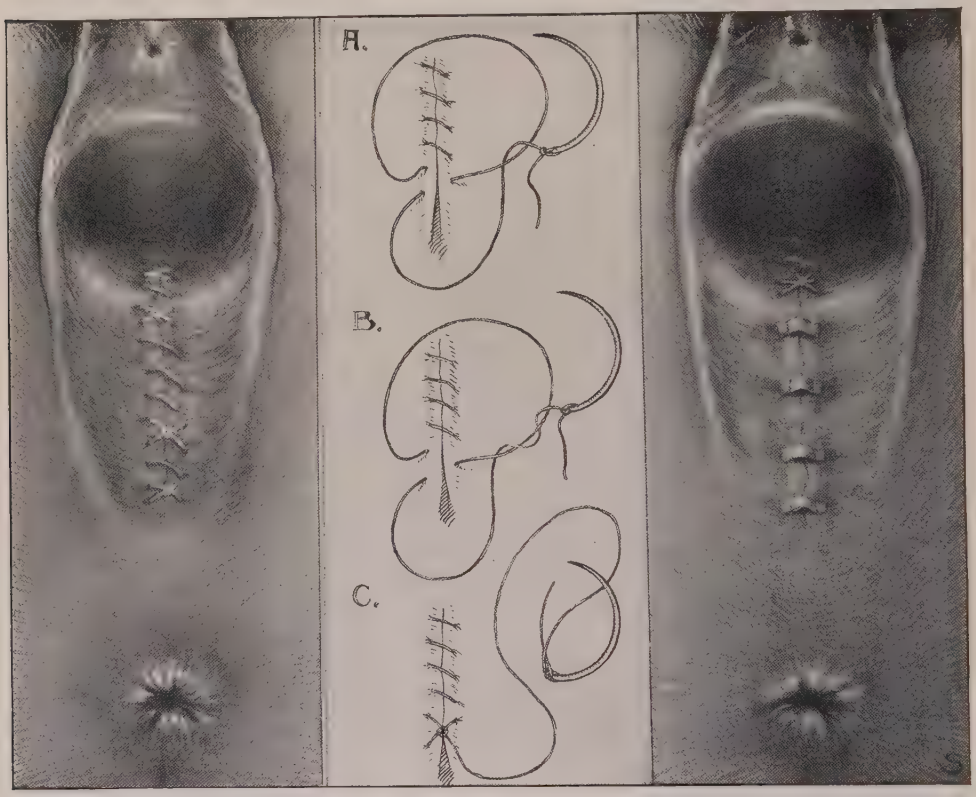


Fig. 261. Fig. 262. Fig. 263.

Fig. 261. The vaginal wound closed. If a continuous suture is used it should be locked securely at intervals, as here shown.

Fig. 262. Details of locking a continuous suture. The needle is put through the loop once, as shown in *A*, and then through the loop again, as shown in *B*, and then drawn tight, as shown in *C*. A half-locked suture is a suture looped once, as in *A*, and then drawn tight. If there is bleeding from the wound margins, it is well to half-lock every loop of the suture. This compresses the wound margins and checks oozing better than the plain suture.

Fig. 263. The outer portion of the wound closed by clips. They should be removed in five days.

take hold also of the deeper tissues, in order to fasten down this redundant area of vaginal wall.

It is well to lock the running suture at intervals. The method of locking the suture securely is shown in Fig. 262. If preferred, clips may be used to close

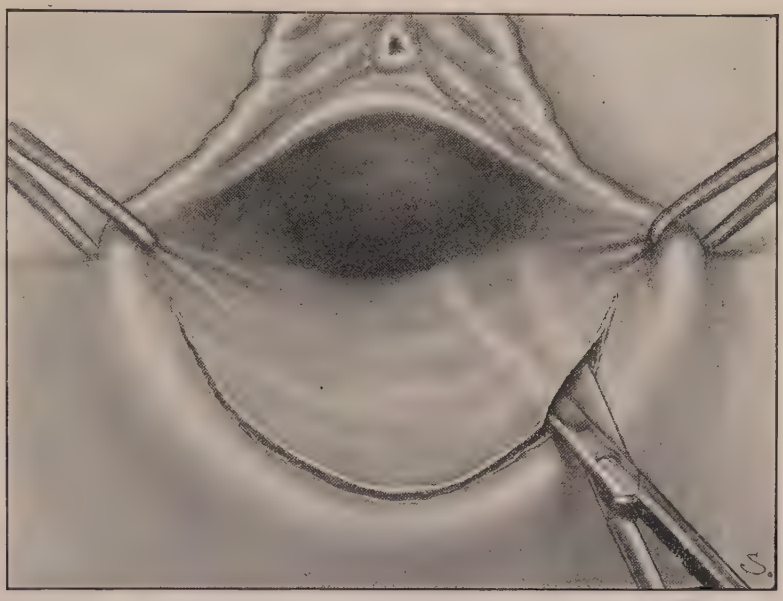


Fig. 264. Another method of separating the vaginal flap. The blunt scissors are thrust under, closed. They are then opened and withdrawn. This is a very rapid method, but it carries more danger of injury to the rectum.

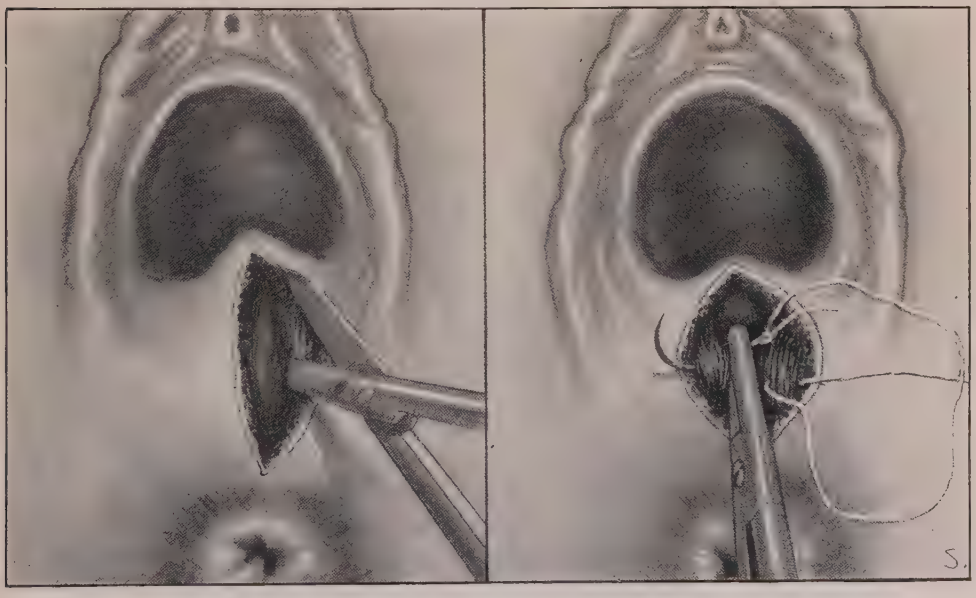


Fig. 265. Fig. 266.

Fig. 265. Opening the pelvic floor by a vertical incision, as described by Hill. By working through the vertical incision with scissors, the sling is exposed for suturing.

Fig. 266. The first sling-approximation suture passed.

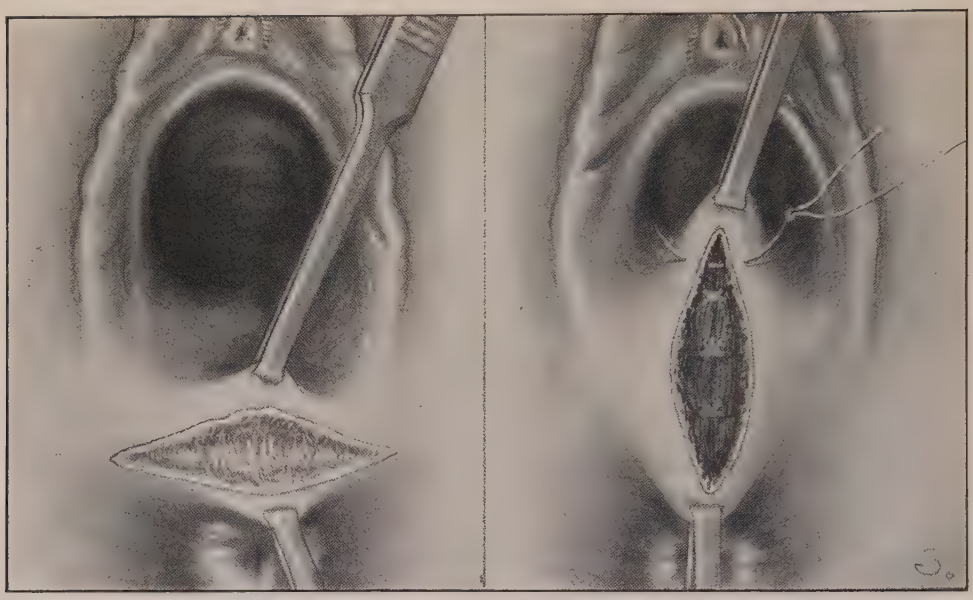


Fig. 267. Fig. 268.

Fig. 267. Opening the pelvic floor by a low transverse incision as described by Dorsett. When the incision has been extended through the superficial tissues, the flap is raised and the levator-sling exposed.

Fig. 268. After the sling-approximation sutures are in place, the wound is stretched vertically and closed in that direction, as here indicated.

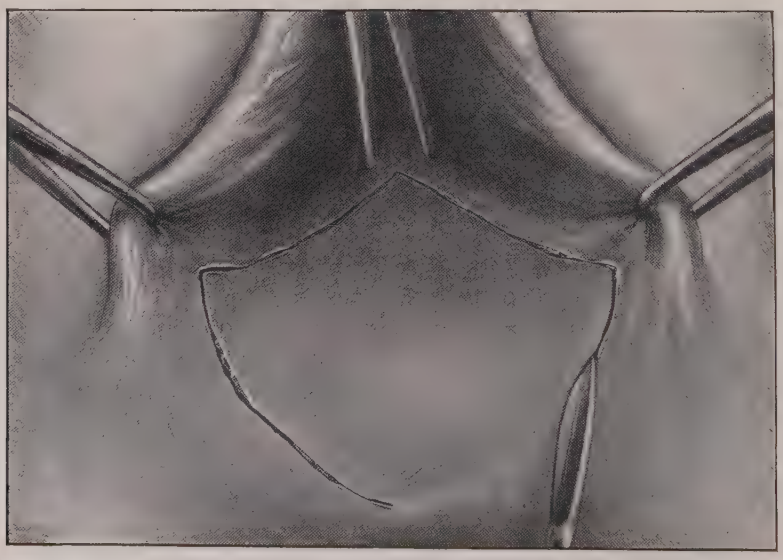


Fig. 269. Hegar's triangular method of denudation. The area to be denuded is first outlined with the knife.

the outer portion of the wound (Fig. 263). For suture material, 40-day catgut No. 1 is very satisfactory throughout, for both deep and superficial sutures. If catgut chromicised for less than twenty days is used, tension sutures of silkworm-gut should also be employed.

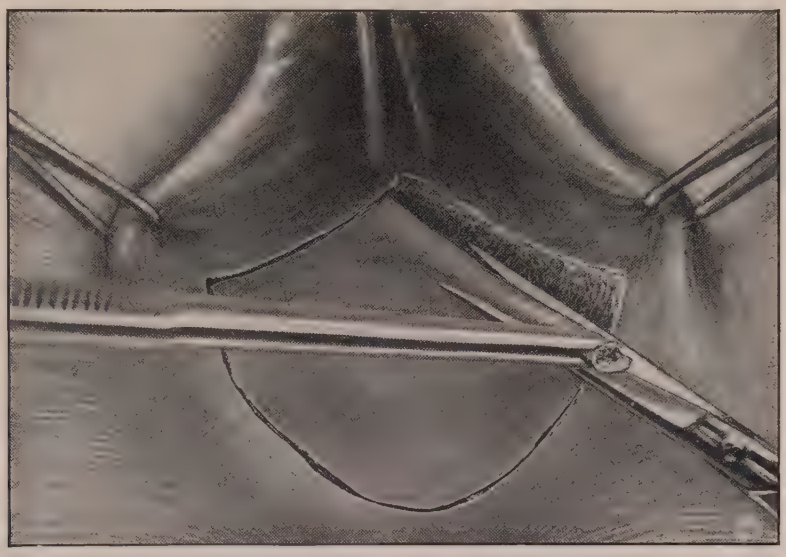


Fig. 270. The mucosa is then grasped with a tissue forceps and drawn tense, and the tense strip is clipped off with scissors.

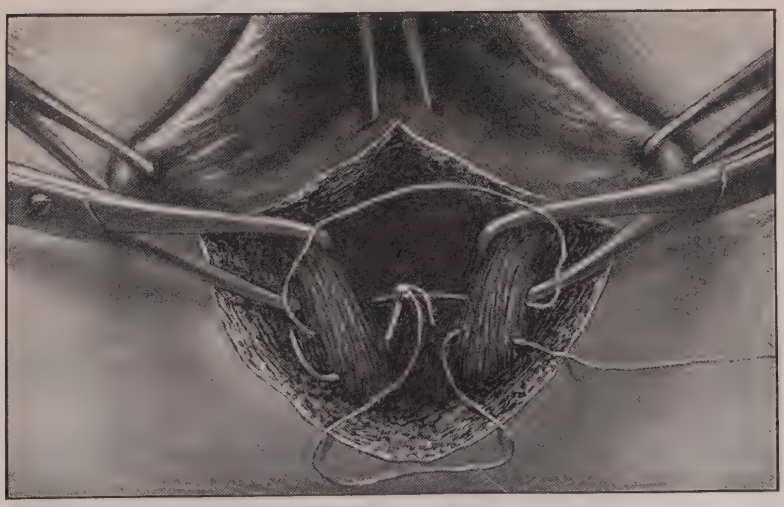


Fig. 271. The deeper tissues are then separated and the sides of the musculo-fibrous sling exposed. The sling-approximation sutures are then passed in the usual way.

Variations in Technique.

Another method of separating the vaginal flap. Some operators prefer to raise the flap by blunt dissection with scissors thrust under the vaginal wall, as shown in Fig. 264. Injury to the rectum is more likely to occur with this method than where the parts are laid open and the separation is made under the guidance of the eye.

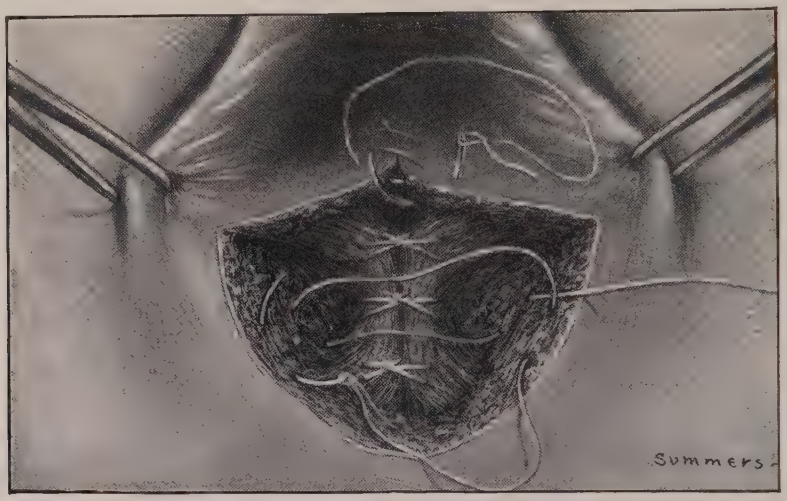


Fig. 272. After the sides of the sling and the superficial tissues in front are approximated, the wound is closed by a running suture of chromic catgut. Tension sutures of silkworm-gut are also used by some operators.

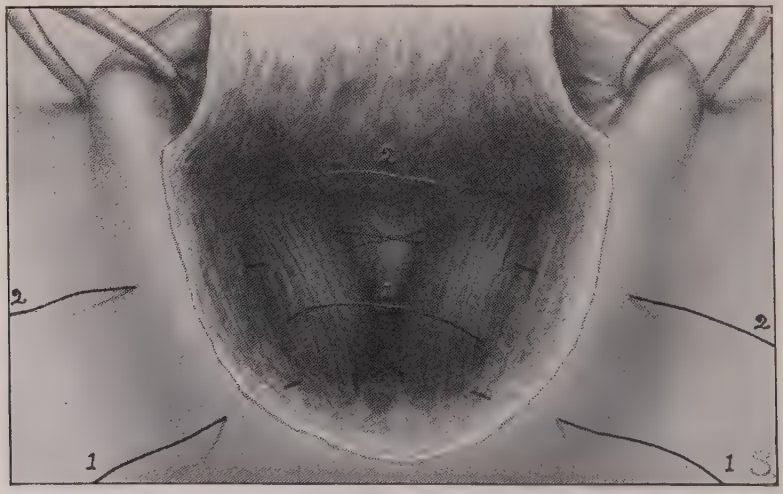


Fig. 273. Approximating the sling with figure-of-eight sutures extending to the surface. Each suture passes through the skin on the patient's left side, through the left side of the sling, through the right side of the sling, then back through the left side of the sling, through the right side of the sling again and out through the skin of the right side. When passed from the perineal surface, as here indicated, silkworm-gut is the material used.

Opening the pelvic floor by a vertical incision (Hill). A vertical incision is made, as indicated in Fig. 265, extending to near the anus. Through this incision, the sides of the pelvic sling are exposed by dissection with scissors (Fig. 265). Then the prominent rectal wall is pushed back and, under the

Fig. 274. Holden's method of using figure-of-eight sutures. They are of chromic catgut and are passed from the mucous surface. Each suture passes through the vaginal wall on the patient's left side, then through the right side of the sling, then through the left side of the sling, and then out through the vaginal wall on the right side. The perineal wound is to be closed by a superficial suture.

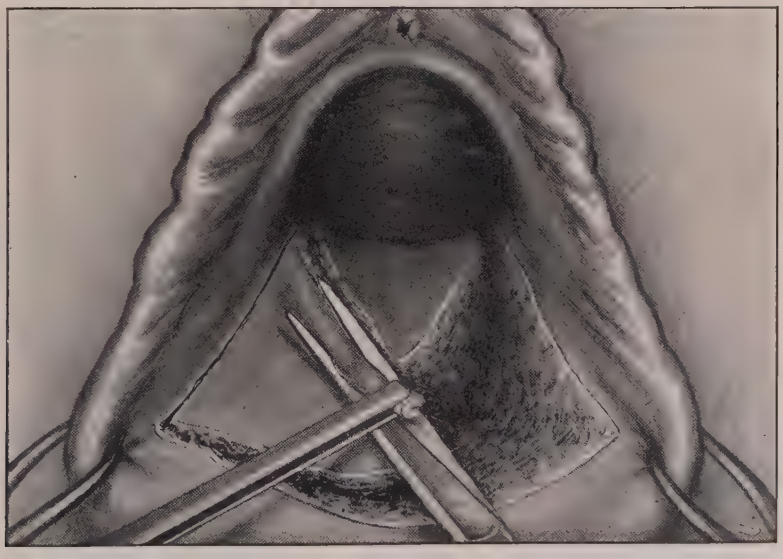


Fig. 275. Emmet's "butterfly" denudation. The whole area is first outlined by the knife, as in the Hegar denudation. Then the mucosa over the outlined area is removed by scissors, as here indicated.

guidance of the fingers, sutures are passed into the sides of the sling (Fig. 266), and the sides of the sling are approximated in the median line. Particular attention is given by Dr. Hill to the separate approximation of the superficial perineal structures. The operation is completed by the closure of the perineal incision.

Opening the pelvic floor by a low transverse incision (Dorsett). A transverse incision is made a short distance above the anus, as shown in Fig. 267. Through this the sides of the musculo-fibrous sling are exposed and brought together in the median line by buried sutures (Fig. 268). The transverse perineal wound is then pulled apart in such a way as to make its long axis vertical, as indicated

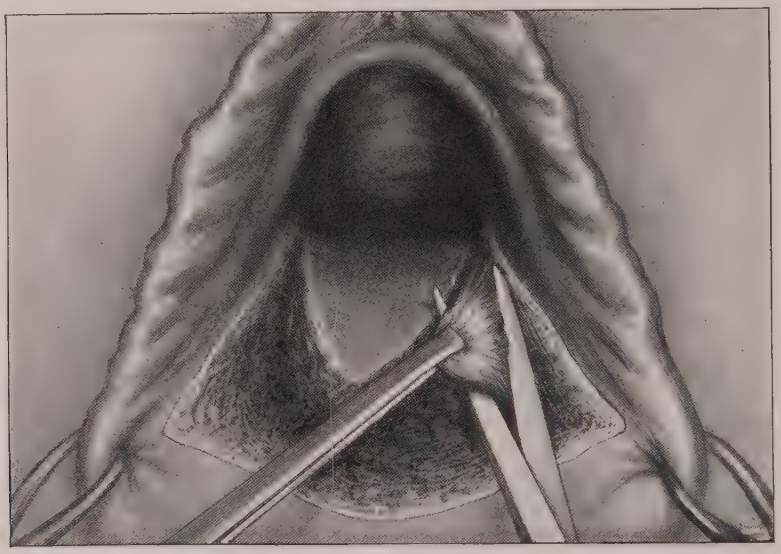


Fig. 276. Excision of deep tissues at the injured portion of the pelvic sling. The excision of one or more layers of tissue from the lateral region of each side, as here shown, removed the scar-tissue in the injured area and permitted shortening of the sling by approximation of the ends, as shown in Fig. 277.

in Fig. 268. The wound is then closed from side to side, leaving a vertical line of union.

Excision of mucosa over a triangular area. This is the Hegar method of denudation so long in use. The area is outlined with a knife, as shown in Fig. 269. The tissue is then removed in strips by scissors. The strip to be removed is grasped with the tissue forceps and drawn so as to form a line of tension, which line of tense mucosa is then excised with the scissors, as shown in Fig. 270.

Through the large opening thus made the levator muscles, with their fasciæ, are isolated and approximated by sutures, as shown in Figs. 271 and 272. The more superficial tissues are then approximated and the wound closed, as indicated in Fig. 272.

Levator-approximation by figure-of-eight sutures. The ordinary figure-of-eight sutures for the purpose are shown in Fig. 273. When passing them thus from the perineal surface, it is customary to use silkworm-gut. The course of each suture, easily traced in the illustration, is, through the skin on the patient's left side, through the sling on the left side, through the sling on the right side, then back through the sling on the left side, then through the sling on the right side again, and then out through the skin on the right side. When such su-

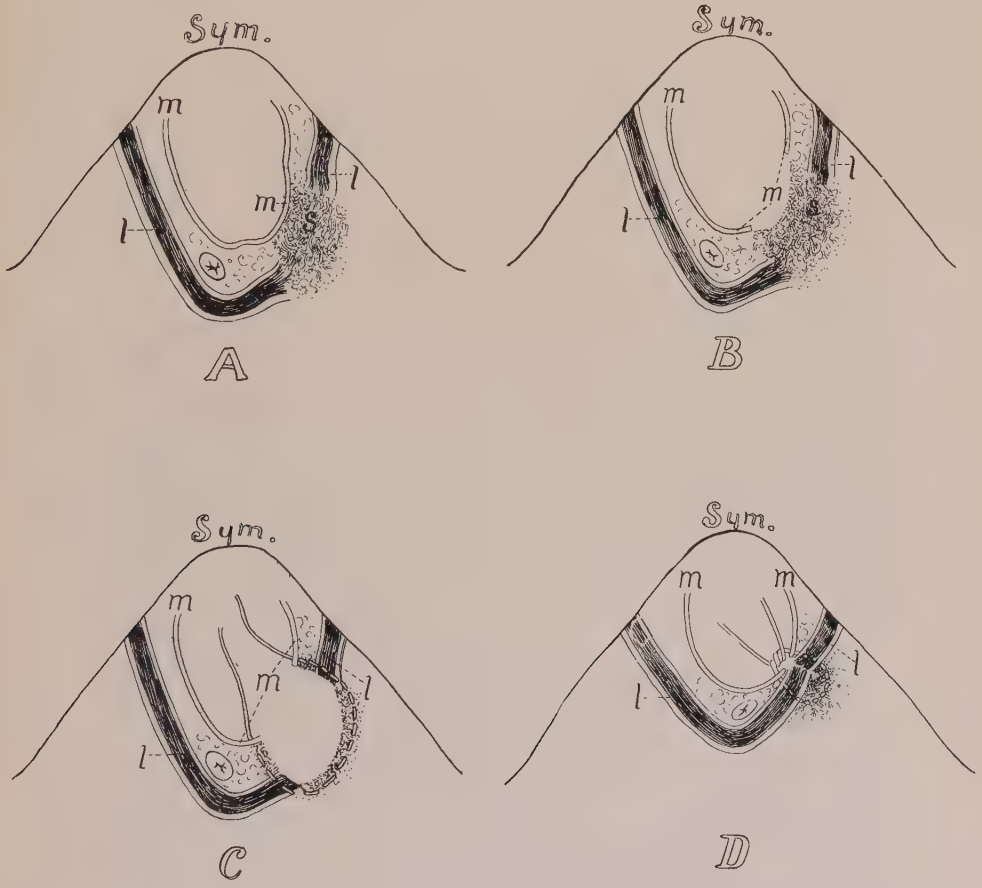


Fig. 277. Explanation of the excision of deep tissues at the injured portion of the pelvic sling. *l.* Pelvic sling composed of the levator ani muscles and the fascia above and below; *m.* vaginal mucosa; *s.* scar-tissue between the torn and separated ends of the pelvic sling. *A.* Before denudation. *B.* After denudation, the vaginal mucosa having been removed over the injured area. The scar-tissue still separates the torn ends of the pelvic sling *C.* After the excision of deep tissues in the injured area. This shows also the course of the sutures for approximating the torn ends of the musculo-fibrous sling. *D.* The sutures tied, approximating the torn and separated ends of the pelvic sling.

The method of shortening the sling by lateral excision and approximation is shown here because of its historical importance. It was this work in the deep tissues which gave permanency of result to pelvic-floor repair by the Emmet method—hence the importance of this addition to Emmet's original technique. Now, however, it has been superseded by the more simple and effective median subvaginal approximation of the sides of the sling.

tures are tied, they approximate both the deep tissues and the superficial wound, and there are no knots or buried sutures left in the wound.

Holden uses chromic catgut for his figure-of-eight sutures, and passes them from the vaginal surface, as shown in Fig. 274. Tracing each suture, it passes through the mucosa on the patient's left side, then through the right side of the sling, then through the left side of the sling and then out through the vaginal mucosa on the right side.

Emmet method of denudation (Fig. 275). This is given principally because of its historical importance. It is not so satisfactory for the present-day operation on the deep structures as are other methods of opening the pelvic floor. When first used it was a great step in advance. It was also a very satisfactory method of opening the pelvic floor for shortening of the pelvic sling by lateral excision (Figs. 276 and 277) or by lateral folding. This, however, has now been superseded by subvaginal approximation of the sides of the sling in the median line, and consequently the "butterfly" denudation is passing out of use.

Repair of Lacerated Sphincter Ani.

When the sphincter ani muscle has been torn through completely, the ends gradually separate more and more until, after some years, they are found widely separated, as shown in Fig. 278. This separation of the ends is due to contraction

Fig. 278. Laceration through the sphincter ani muscle. In the course of months and years the torn muscle tends to straighten out, causing the torn ends to become widely separated, as here shown. Also, the upper angle or point of the rectal tear is gradually drawn downward.

and retraction of the torn muscle, which straightens out and at the same time becomes shrunken and atrophic. At operation, this shortened sphincter muscle must be stretched in order to complete the circle of the anus. Also, in very long-standing cases, the muscular tissue may be so atrophic that it must be strengthened

by exercise for several weeks or months after repair, before complete fecal control is established. Another effect of this straightening out of the sphincter is that the point or upper angle of the tear in the recto-vaginal septum is drawn down and the scar approaches a straight line (Fig. 278). The small red area, so frequently seen in these cases, and giving the impression of granulation tissue, is rectal mucosa exposed by the tear.

In these cases of torn sphincter there are two methods of repair, the regular method and the flap method. In each plan the first step is to stretch the contracted sphincter muscle. The subsequent steps differ in the two methods.

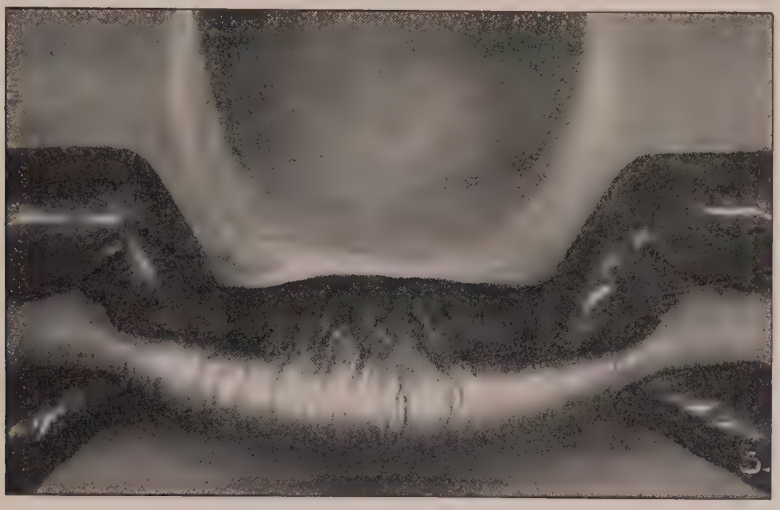


Fig. 279. Stretching the atrophic and contracted sphincter ani muscle, preparatory to repair.

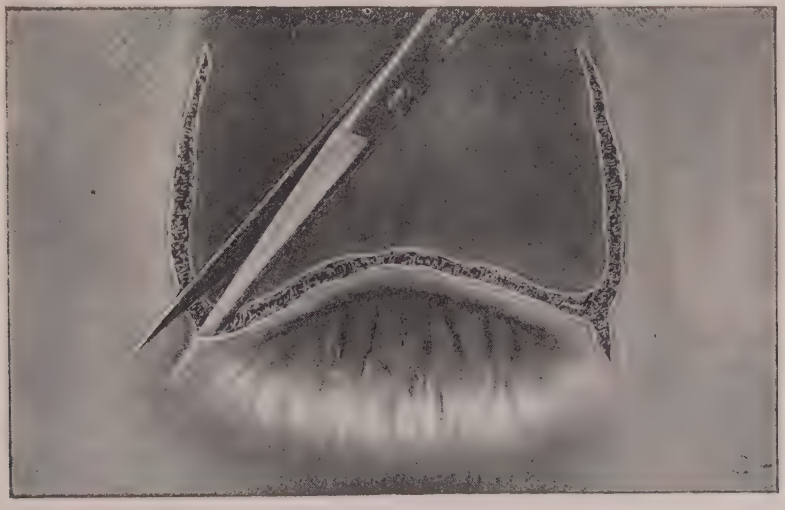


Fig. 280. Opening the pelvic floor in a case with laceration through the sphincter muscle. The incision must be so placed as to permit exposure of the torn ends of the sphincter.

Regular Operation.

1. Stretching the shrunken sphincter. It is advisable to stretch the shortened sphincter muscle so that it may encircle the anal opening again without undue

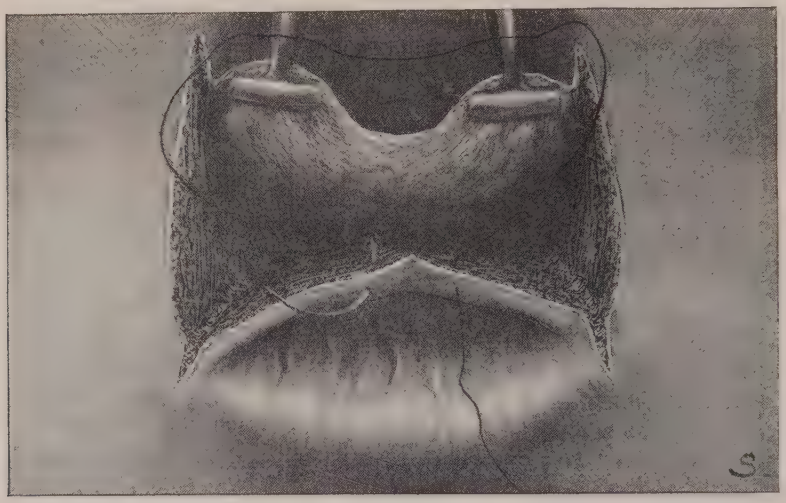


Fig. 281. The flap raised. Beginning the closure of the rectal wound. Passing the first rectal suture. These sutures should be of linen or silk, and should be interrupted. Each suture passes through the wall from the rectal mucosa to the raw surface, then through the other wall from the raw surface to the rectal mucosa, and is tied in the rectum. After healing, the sutures gradually cut through the included tissues and drop out.

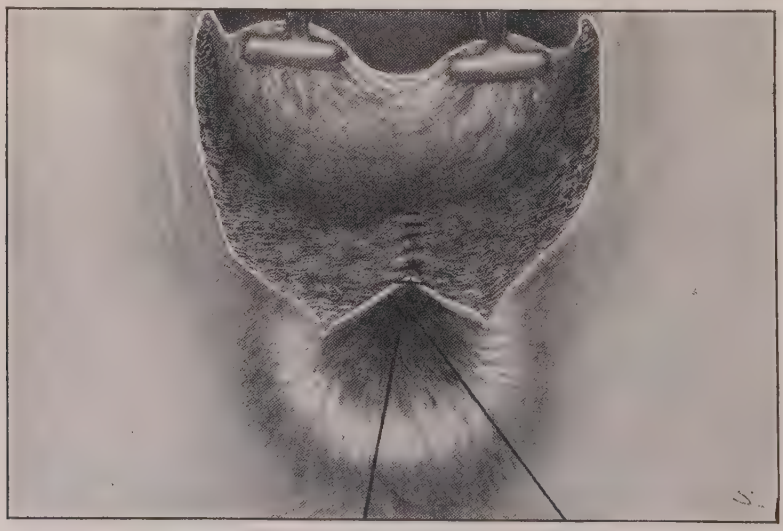


Fig. 282. The rectal wound nearly closed.

tension. The moderate lengthening of the muscle required is easily accomplished by grasping it with gloved fingers and stretching as indicated in Fig. 279.

2. Opening the pelvic floor. In such a case, the pelvic floor is opened as shown in Fig. 280. This incision gives access to the separated ends of the sphincter ani muscle as well as to the levator sling. After the vaginal flap has been partially raised (Fig. 281), the rectal tear is sutured as shown in Figs. 281, 282 and 283. This shuts off the rectal cavity from the operative field and diminishes the chance of infection in the subsequent work.

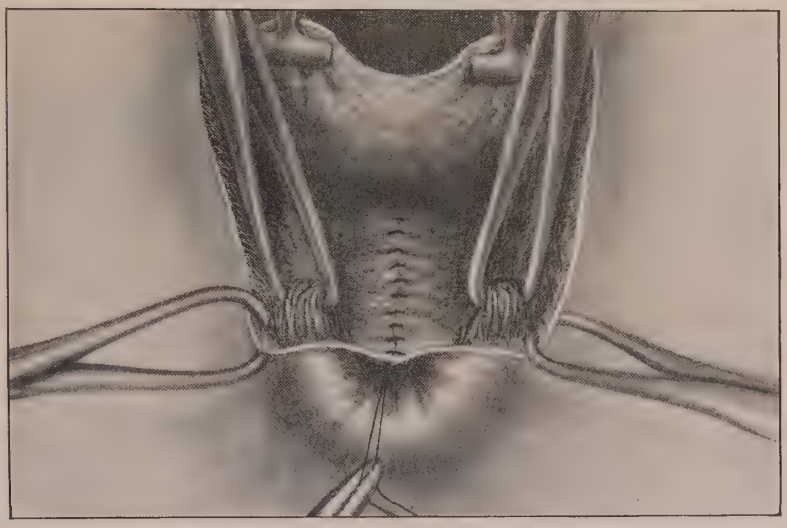


Fig. 283. The closure of the rectal wound completed. The last suture is left long to serve as a tractor. The ends of the torn sphincter have been exposed and caught with forceps, preparatory to suturing.

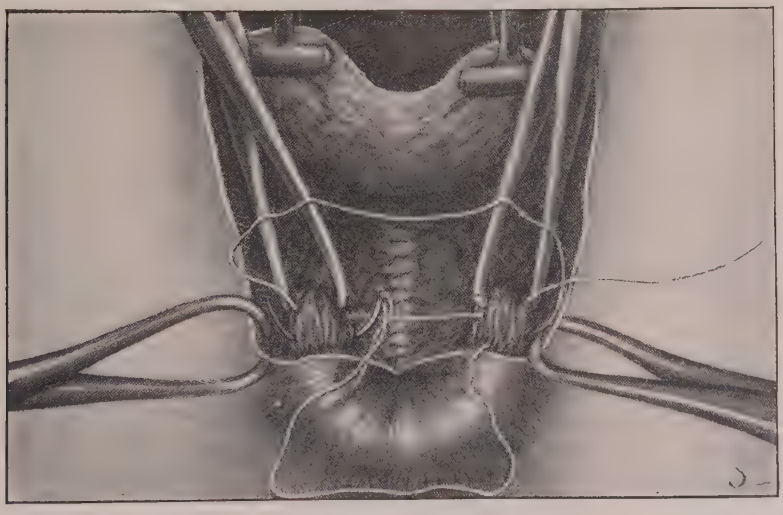


Fig. 284. The first sphincter suture passed. It is well to make two rounds with each suture, catching up different portions of the sphincter each time.

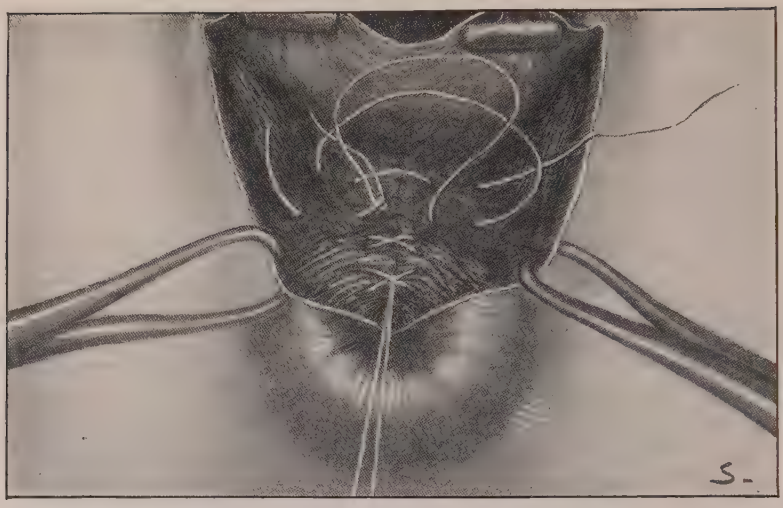


Fig. 285. Sphincter ends united by two sutures. The next step is to cover the rectal suture-line by approximating the tissues immediately over it with two or three buried sutures—the first of such sutures is here shown.

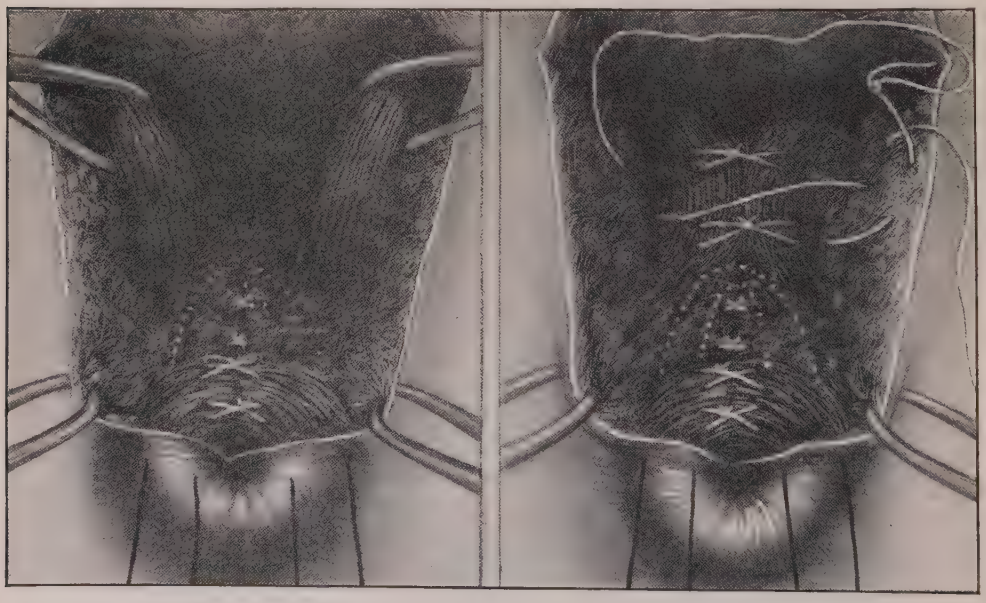


Fig. 286. Fig. 287.

Fig. 286. The repair of the sphincter and rectal wall is further reënforced by one or two silkworm-gut sutures, passed as here indicated. Each suture passes through the skin, the sphincter muscle and the deep tissues of one side up to above the angle of the rectal tear. The needle is then reëntered at the same place and passed down the other side, through the deep tissues, the sphincter muscle and the skin. These sutures are left loose, to be tied later. After the reënforcing silkworm-gut sutures are passed, the musculo-fibrous sling is exposed and the sides united in the usual way.

Fig. 287. The sling-approximation sutures have been placed and tied. One of the sutures for the approximation of the more superficial perineal tissues is being passed.

3. Suturing the sphincter ani. The separated ends of the sphincter muscle are found and caught as indicated in Fig 283. Sutures are then passed to fasten the ends securely together as shown in Figs. 284 and 285. These are buried sutures of chromic catgut. One or two buried sutures are then placed higher to protect the sutured rectal wound (Fig. 285).

Reënforcing sutures of silkworm-gut are then passed through the sphincter and up above the angle of the rectal tear and out through the sphincter on the other side. The course of each of these reënforcing sutures is plainly seen in Figs. 286 and 287. These are not tied until all other suturing has been completed.

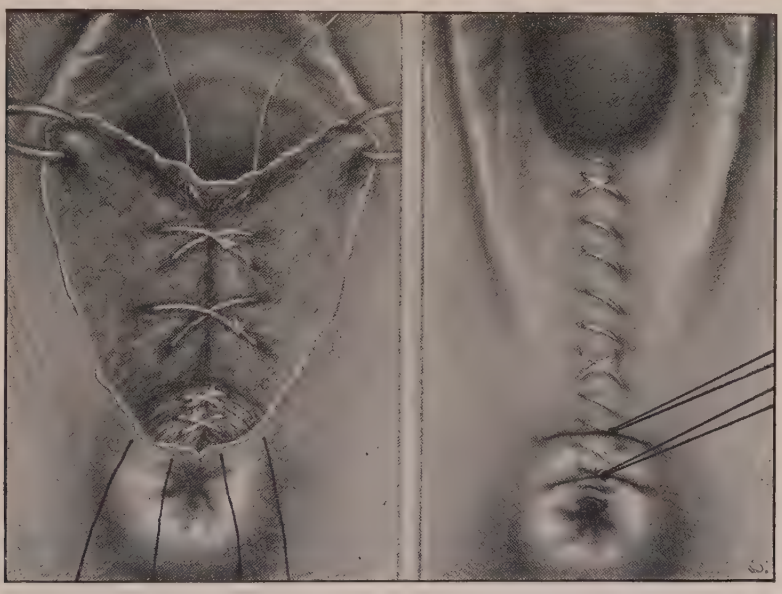


Fig. 288. Fig. 289.

Fig. 288. Superficial perineal tissues approximated, and the closure of the wound begun.
Fig. 289. The wound closed and the reënforcing silkworm-gut sutures tied. Operation complete.

4. Shortening of the pelvic sling. After the rectal and sphincter injuries have been repaired, the levator sling is shortened in the usual way as shown in Figs. 286 and 287. The more superficial tissues are then sutured, as shown in Fig. 288 and the wound is closed (Fig. 289).

Flap Operation.

Ristine (Americal Journal Obstetrics, 1899) first suggested an "apron" flap in the repair of these cases of torn sphincter, and this technique was further elaborated by Watkins (Surgery, Gynecology and Obstetrics, 1908). The steps are as follows:

1. Stretching the contracted sphincter. This is the same as the first step in the regular operation.

2. Opening the pelvic floor. The incision through the vaginal mucosa is placed from one-half to one inch above the edge, as shown in Fig. 290, and the sphincter ends are exposed by turning down the flap (Figs. 291 and 292) which serves subsequently as a protection for the sutured area. This flap eliminates the row of sutures in the rectum. If it functionates, that is, if it is not button-holed and does not slough nor retract unduly, it eliminates infection by that route, which infection is a common cause of failure in this operation.

The incisions at the corners should be kept well above the sphincter ends (Fig. 290) so that no part of the suture line is drawn into the rectum by the retraction of the flap in the first two weeks following operation.

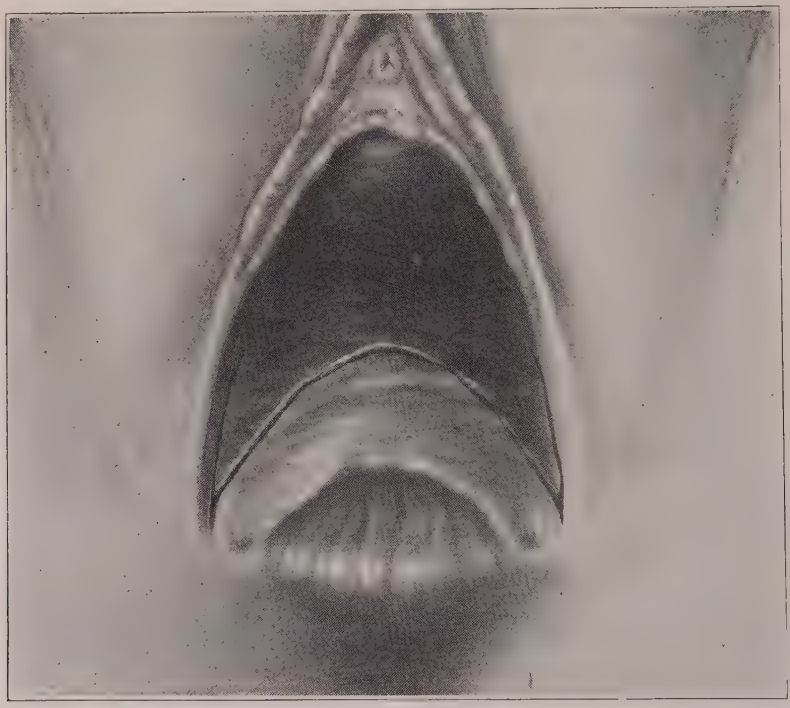


Fig. 290. Flap Operation for Torn Sphincter Ani. The incision for opening the pelvic floor. The angle of the incision on each side should be kept well above the depression marking the end of the sphincter.

The upper flap, also, is raised for the usual repair of the pelvic floor (Figs. 292 to 294).

3. Suturing the sphincter ani. The sphincter ends are caught with forceps and identified, and sutured with 40-day chromic catgut, as shown in Figs. 291 to 293. It is well to reënforce this by a silkworm-gut suture, passed as indicated in Fig. 292.

4. Shortening the pelvic sling. After the sphincter has been sutured, the pelvic floor is repaired in the usual way (Figs. 293 to 295), and the wound closed (Figs. 296 to 299).

Fig. 291. Fig. 292.

Fig. 291. Turning down the flap. Care should be taken to avoid separating the flap too near to the recto-vaginal scar, as that might interfere with its blood supply and cause sloughing. Button-holing of the flap also is to be avoided—a difficult task at times. If the flap is button-holed in a location to interfere with its integrity, it is preferably excised and the regular repair previously described carried out.

Fig. 292. Identifying and suturing the sphincter ends. The course of the silkworm-gut suture is also shown.

Fig. 293. Fig. 294.

Fig. 293. Sphincter ends sutured, and the edge of the levator sling on each side being identified.

Fig. 294. Suturing the levator muscles and fascia as in the usual repair of the pelvic floor.

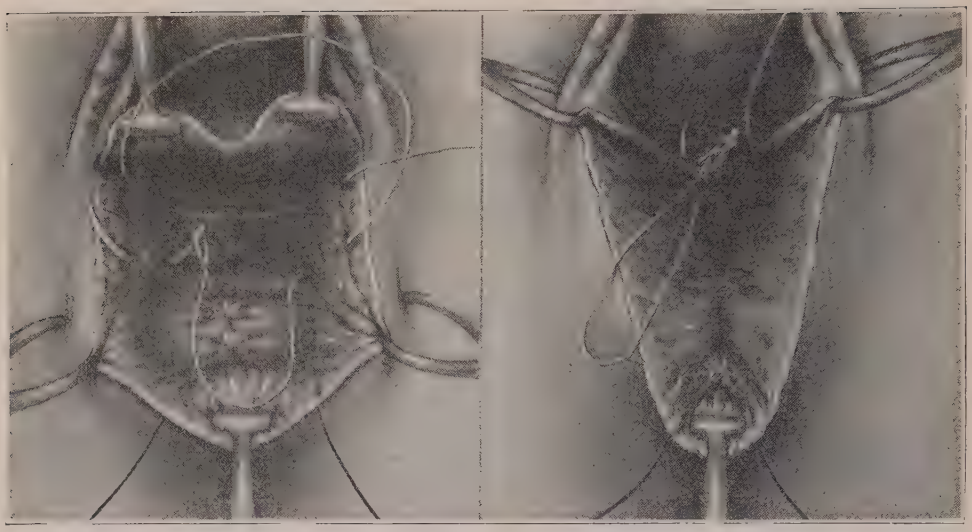


Fig. 295. Fig. 296.

Fig. 295. The sphincter and the levators have been sutured and the suture is in place for approximating the more superficial tissues.

Fig. 296. Closing the opening in the vaginal wall.

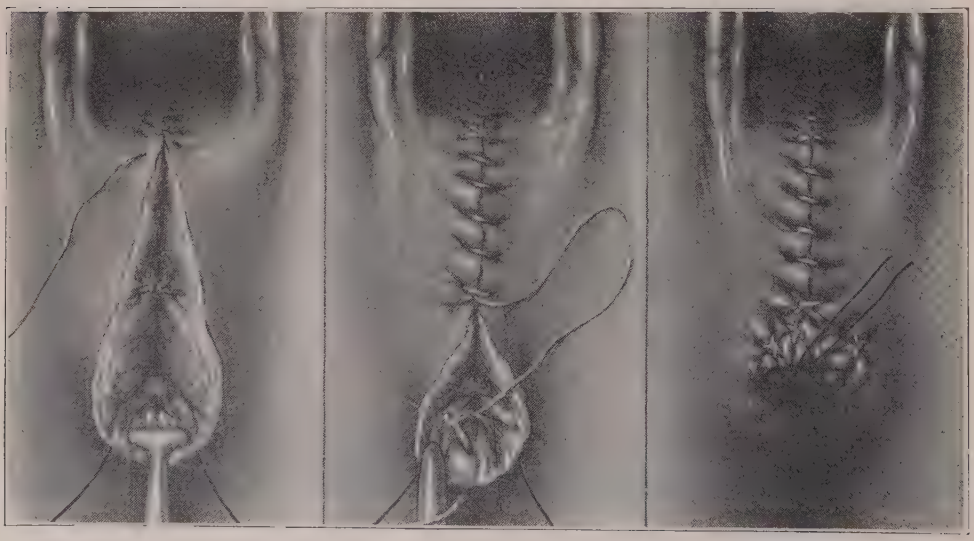


Fig. 297. Fig. 298. Fig. 299.

Fig. 297. Closing the perineal wound.

Fig. 298. Bringing up the flap.

Fig. 299. The flap is sutured and the silkworm-gut suture also has been tied.

Rectocele.

A moderate rectocele is taken care of by the usual repair of the pelvic floor. A marked rectocele requires special suturing. The vaginal flap is separated very

Fig. 300. Special step necessary in cases of marked rectocele. The flap is raised far up in the median line as well as at the sides. The pouch of the rectocele is then obliterated by two or more rows of buried sutures, which plicate the overstretched rectal wall. The first row of buried sutures is here shown.

Fig. 301. Special step necessary in rectocele. The first row of plicating sutures has been completed and the second row is being passed. After this, the sling-approximation sutures are passed and the pelvic floor repair completed in the usual way.

high—in some cases two-thirds of the distance to the cervix uteri. Then, before the deep muscular sutures are passed, the anterior rectal wall is folded in by two or three rows of buried sutures, as indicated in Figs. 300 and 301. After that the pelvic sling is shortened by the usual subvaginal approximation.

For extensive rectocele, Bissel (Journal of Obstetrics, July, 1918) has suggested and illustrated a method of overlapping the stretched recto-vaginal tissues by sliding the vaginal wall of one side over a denuded area on the other side.

Cystocele.

Cystocele of the most severe type occurs in conjunction with prolapse of the uterus, and its correction constitutes one of the important features in operation for prolapse. In fact, in many of the severe cases the most important problem is the permanent correction of the cystocele, the correction of the uterine prolapse being only incidental. This is evident from a study of the interposition operation and of most of the other effective operations for severe prolapse. The treatment for severe cystocele, therefore, will be found in Chapter II. The fascial overlapping operation (Rawls) there detailed may be used for any cystocele but it is particularly indicated in the severer grades.

Cystocele of moderate degree, not complicated by uterine prolapse or retrodisplacement, may be corrected by simple repair of the utero-pubic fascia followed by repair of the pelvic floor. This work through the anterior vaginal wall is often referred to as anterior "colporrhaphy," but it should go much deeper than suture of the vaginal wall. It should bring together the deep fascial structures, as shown in Figs. 190 to 192. The steps in the work are as follows:

1. Incision through the anterior vaginal wall. This extends from the vaginal entrance backward to the cervix uteri. To make the wall tense, to facilitate incision, it is caught at the anterior and posterior ends of the intended incision, with tenaculum-forceps. Fig. 302 shows the anterior tenaculum-forceps in place and the incision being made. The posterior tenaculum-forceps is placed just in front of the cervix, which it pushes backward and downward in the pelvis, in order to make tense the anterior vaginal wall.

It is important in these cases to avoid the common practice of drawing the cervix outside the vagina. There is no marked uterine prolapse or retrodisplacement in the cases under consideration; and if, to correct the moderate cystocele, the cervix is drawn outside the vaginal entrance, the utero-sacral ligaments and broad ligaments are overstretched and the patient is in worse condition at the close of the operation than she was at its beginning. The overstretched uterine supports will probably, sooner or later, permit retrodisplacement and prolapse. Of course, where there is already marked prolapse no harm results from drawing the cervix outside the vagina for work on the utero-pubic fascia; for the ligaments are already relaxed and the relaxation is taken care of in the subsequent steps of the prolapse operation. It is quite different, however, in the case under consideration, in which no prolapse is present. Here, the posterior supporting ligaments

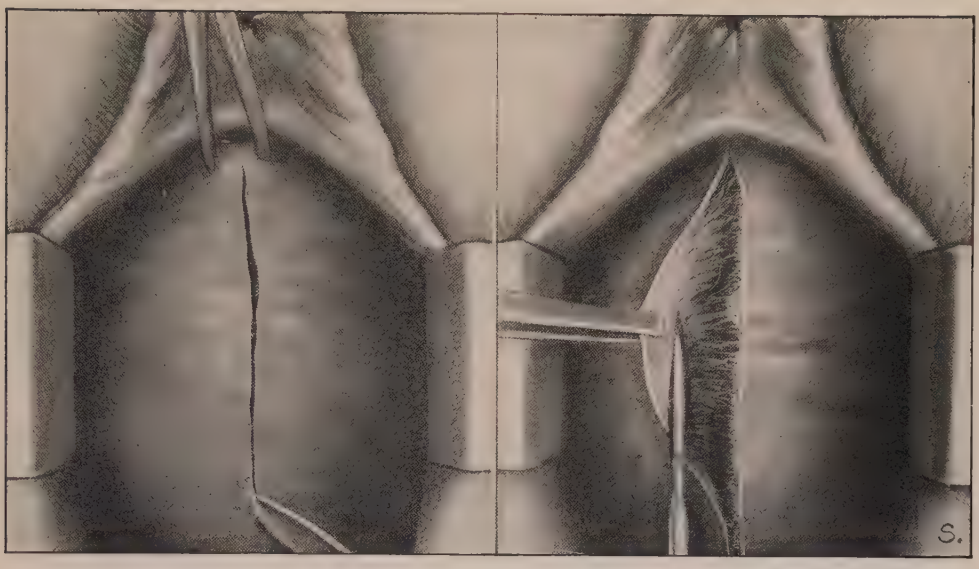


Fig. 302. Fig. 303.

Fig. 302. Cystocele operation. Making the incision.
Fig. 303. Beginning the separation of the vaginal wall from the underlying tissues.

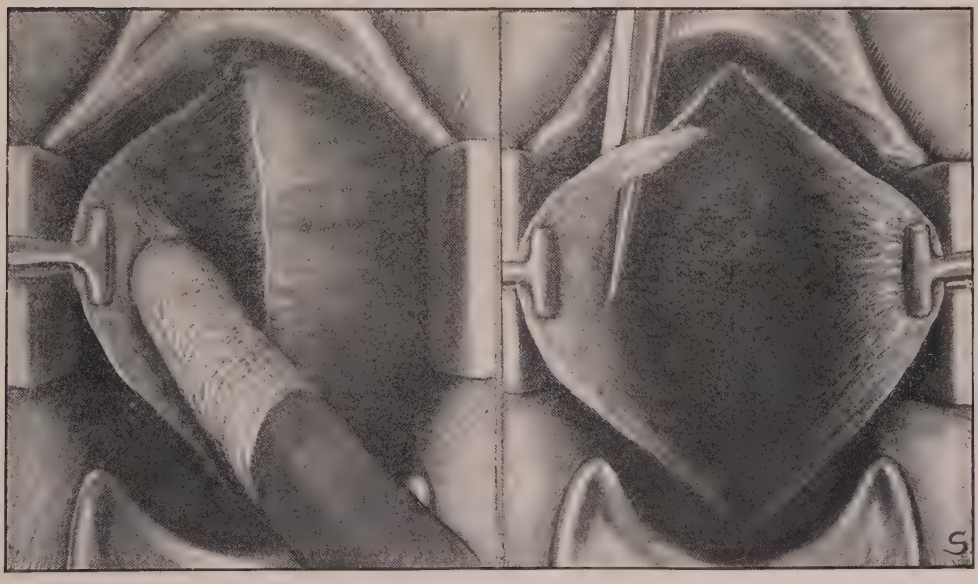


Fig. 304. Fig. 305.

Fig. 304. Rolling off the underlying tissues from the vaginal wall by the gauze-covered finger.
Fig. 305. Both vaginal flaps raised. Trimming away the excess of vaginal wall.

of the cervix uteri are intact, and it is important to preserve them intact even though such preservation makes the work decidedly more inconvenient.

This same error (drawing the cervix too far forward) is frequently made in doing a simple curettage—the overstretching of the utero-sacral and broad ligaments leading to subsequent retrodisplacement, as explained in Chapter V.

2. Separation of the vaginal wall from the underlying tissues. The margin of the flap is freed by scissors or knife, as indicated in Fig. 303. It is then grasped with a forceps and the underlying tissues rolled off with the gauze-covered finger (Fig. 304). When both flaps have been well separated, the excess of vaginal wall is trimmed away (Figs. 305, 306), leaving just enough to meet in the median line over the repaired fascia, as indicated in Fig. 307. If preferred, the trimming of the vaginal flaps may be delayed until after the fascial repair.

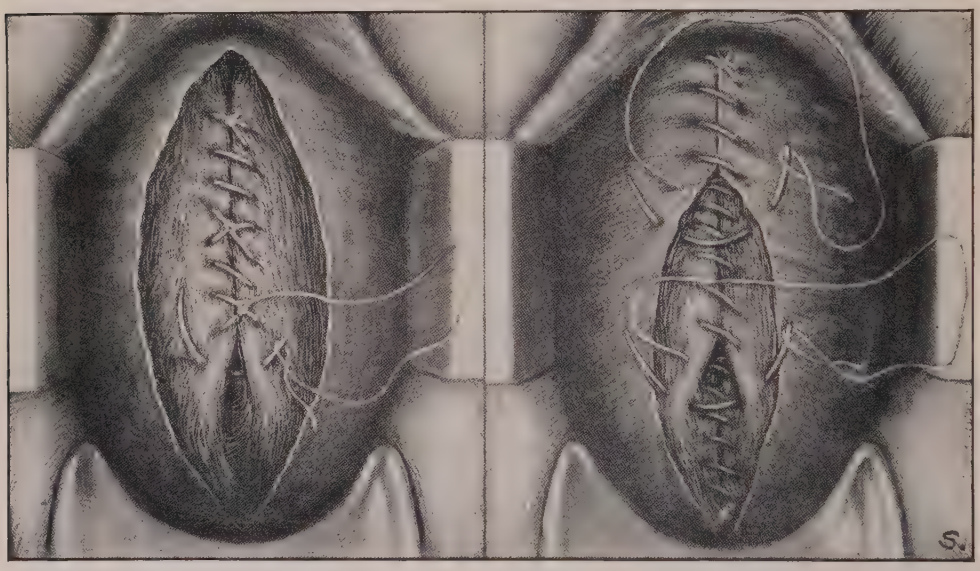


Fig. 306. Fig. 307.

Fig. 306. The first row of buried sutures, for approximating the deep tissues (utero-pubic fascial plane).

Fig. 307. Completing the second row of buried sutures. Beginning the closure of the vaginal wound, the excess of vaginal wall having been trimmed away.

3. Shortening of the utero-pubic fascial plane transversely. This is accomplished by two or three rows of buried sutures as indicated in Figs. 306 and 307. It is more convenient to place the second row of fascial sutures from within outward, rather than from without inward as shown in Fig. 307. The greater the relaxation, the more rows of sutures required. Sufficient sutures should be passed to take up the slack and form a firm side-to-side supporting sling beneath the bladder, as explained in more detail in Figs. 190 to 192.

The tissues of the utero-pubic fascial plane are rolled off the vaginal flap with the bladder. They remain attached to the bladder wall, and the plication of the

plane, as here carried out, consists in turning in and suturing this apparently thickened bladder wall—that is, the fascial plane and the bladder wall are manipulated together. On the other hand, in those very severe cases associated with uterine prolapse, where it is necessary to separate the bladder entirely from the uterus, there is more or less separation of the bladder from the utero-pubic plane, particularly in its posterior half.

4. Closure of the vaginal wound. This is accomplished by a running suture, as indicated in Fig. 307. The suture is of chromic catgut and should be securely locked at intervals. If preferred, the suture may be half-locked (Fig. 262) all the way. The half-locked suture is an excellent one where there is bleeding from the edges.

It is usually more convenient to begin the closing suture at the posterior end of the wound, and finish at the anterior end, instead of beginning it at the anterior end as shown in the illustration.

RECTO-VAGINAL FISTULA.

This is found occasionally in cases of deep injury to the pelvic floor. It is a troublesome complication to deal with, and one that may cause breaking down of a most carefully repaired floor.

Fig. 308.

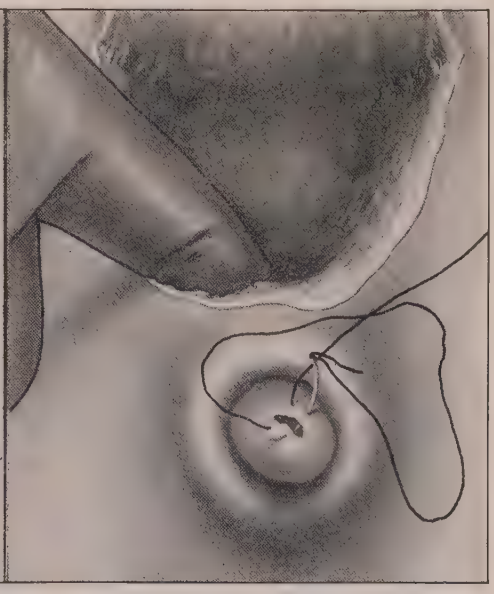


Fig. 309.

Fig. 308. Operation for recto-vaginal fistula. The vaginal flap has been raised, and the suture for closure of the rectal opening is being passed. After reënforcement of the repaired area by two or more buried sutures, the sling-approximation sutures are passed and the pelvic-floor repair completed in the usual way.

Fig. 309. An additional expedient, where the rectal opening is low enough to be invaginated through the anus. When suturing from the rectal surface, silk or linen is used.

After the flap has been raised, as for regular repair of the floor, the opening into the rectum is closed by a chromic catgut suture, as indicated in Fig. 308. For disinfecting the region of the opening, it may be touched with a weak iodine solution (two per cent iodine, in alcohol). After the opening has been closed, it is well to bury it deeper by one or two additional sutures.

When the rectal opening is low enough to be invaginated through the anus, as shown in Fig. 309, the opening may be closed from the rectal side by a fine silk or linen suture. This gives still further protection against leakage of rectal contents. After such rectal suture, the other sutures are passed as in Fig. 308.

After closure of the rectal opening from one or both directions, the pelvic floor is repaired in the usual way.

VESICO-VAGINAL FISTULA.

There are many varieties of vesico-vaginal fistula. They differ in size, in accessibility and in the amount of surrounding scar-tissue. Each of these factors has a bearing on the character of operation required.

In a considerable proportion of the cases, preparatory treatment is necessary before operation. If there is inflammation of the bladder or of the vaginal wall about the fistula, the inflammation should be treated—by urinary antiseptics, by applications to the vaginal margin of the fistula or by irriga-

Fig. 310.

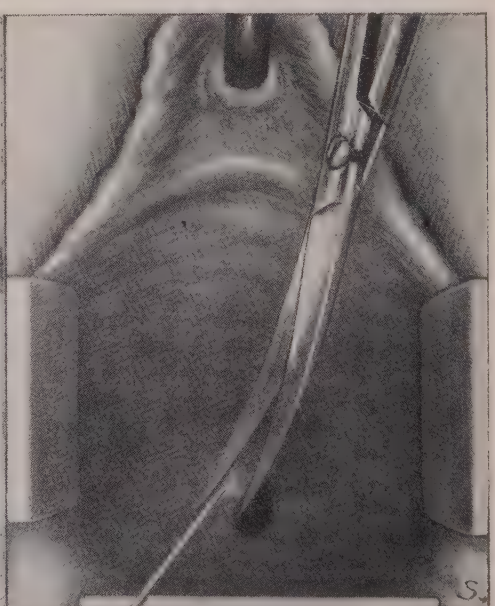


Fig. 311.

Fig. 310. Operation for small vesico-vaginal fistula. A catheter has been introduced through the urethra, and the bladder and fistula are being cleansed by washing with boric acid solution.

Fig. 311. Beginning the denudation of the margin of the fistula.

tion of the bladder and fistula with mild antiseptic solutions. Bladder and vaginal inflammation interfere with healing and should be corrected as far as practicable before operation. If there is persistent chronic cystitis, bacterin treatment may be advisable. For phosphatic incrustations and alkaline urine, benzoic acid may be given. The following, which was used by Emmet, is a very good combination:

℞

Acid Benzoic	6 Gm (℥iss)
Sodii Borat	8 Gm. (℥ii)
Aquæ	240 Cc. (℥viii)

Sig.: Tablespoonful in water three times daily. In four days reduce the dose to a a teaspoonful.

The technique of operation for the various classes of vesico-vaginal fistula will be considered in the following order:

1. Small fistula surrounded by practically normal wall.
2. Large opening, with loss of tissue.
3. Inaccessible vesico-vaginal fistula.
4. Vesico-vaginal fistula with extensive scar-tissue union of bladder to vagina.
5. Vesico-utero-vaginal fistula.

1. Small fistula surrounded by practically normal wall. There is no troublesome scar-tissue. The surrounding wall is soft and pliable and may be easily approximated over the opening. This is the most simple form of vesico-vaginal fistula and is easily repaired.

The first step is to cleanse the interior of the bladder and the fistula by running in boric acid solution, through a catheter introduced through the urethra, and allowing it to run out through the fistula, as shown in Fig. 310. Then the edge of the opening is denuded by excising the mucosa. This is most conveniently accomplished by curved, sharp-pointed scissors with delicate points. For starting, the mucosa may be picked up with a small tenaculum-forceps as shown in Fig. 311. After the first cut is made the end of the strip may be caught in toothed tissue forceps (Fig. 312,A) and the excision continued around the opening. Then the opening is closed by a layer of buried sutures (Fig. 312,B), and afterward the mucosa is closed over as shown in Figs. 312,C and D. The buried suture may be of catgut or silk as preferred. It should be introduced so as to lie close to the bladder mucosa but should not include the mucosa. Fig. 312,E shows the method of introduction of the buried suture, and Fig. 312,F indicates the relations of the sutures in the completed operation.

The bladder should be drained by a retention catheter for four or five days. In the meantime the patient is given some reliable urinary antiseptic internally, and the bladder is irrigated once or twice daily with boric acid solution. The retention catheter is to be employed after all serious bladder injuries, to prevent

distention and stretching of the wound, and to keep the muscular wall at rest and thus favor repair.

2. Large opening with loss of tissue. Here a serious difficulty is encountered in the fact that, on account of loss of tissue, the sides of the fistulous opening cannot be approximated without marked tension which would interfere with healing. The difficulty may be overcome by turning a circular flap and approximating its edges across the opening. An incision is made through the vaginal mucosa all around, as indicated in Fig. 313. The submucous tissue is divided

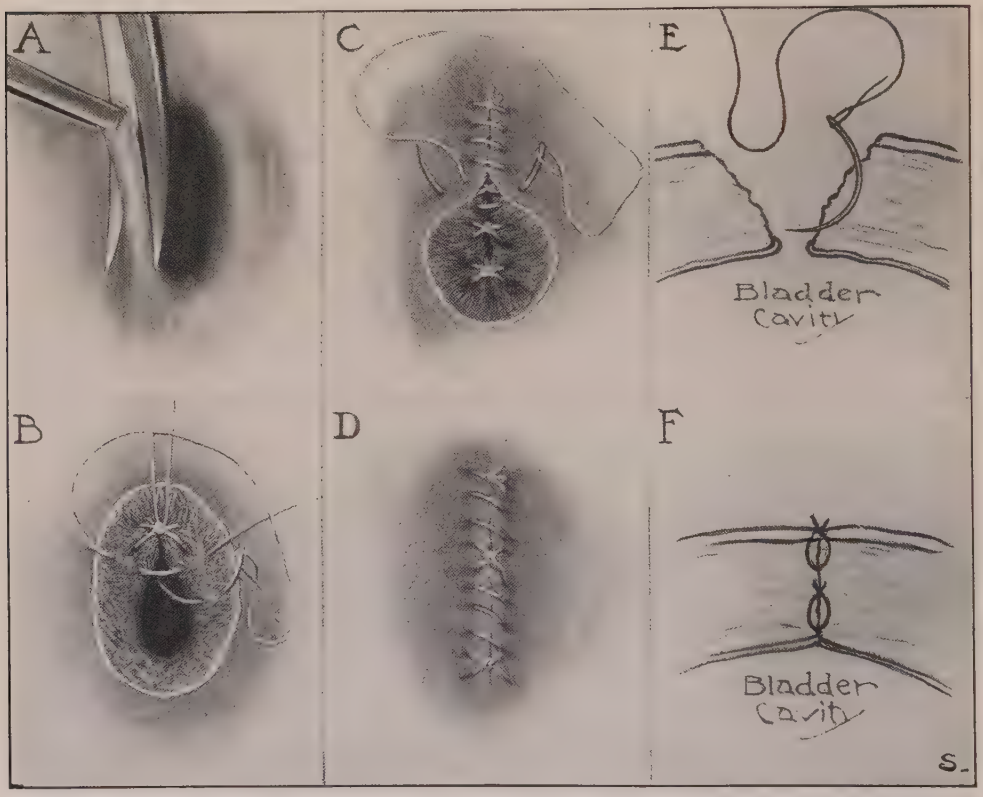


Fig. 312. Details of operation for a small vesico-vaginal fistula. *A.* Denuding the margin of the fistula. *B.* Denudation completed, and the first row of sutures being placed. *C.* Deep sutures completed, and the vaginal wound being closed. *D.* The operation completed. *E.* Sectional view, showing the method of introducing the deep suture. It lies just above the bladder mucosa. *F.* Sectional view, operation completed, showing the relation of the sutures to the layers of the vesico-vaginal septum.

part way to the margin, so as to free the flap sufficiently to permit it to cover the opening without tension. The edges are then turned in and sutured together, as shown in Figs. 314 and 315. Notice that the sutures are entirely submucous. They miss the cut mucosal margin, but pass very close to it and thus make secure approximation. By this method the opening in the bladder wall is closed without tension.

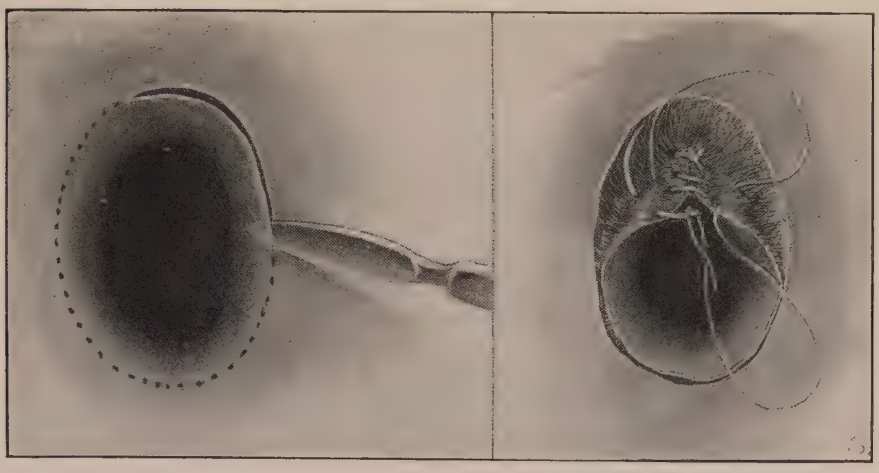


Fig. 313. Fig. 314.

Fig. 313. Operation for large vesico-vaginal fistula with loss of tissue. The incision is extended around the opening, as indicated by the dotted line. The flap of mucosa is to be freed sufficiently to permit the edges to be easily approximated over the opening.

Fig. 314. Suturing the flaps together. Raw surface is approximated to raw surface by passing the sutures as here indicated.

Fig. 315. Fig. 316.

Fig. 315. Completing the closure of the vesical opening by the buried suture. This suture may be of silk or linen or of fine chromicised catgut. The nonabsorbable suture (linen or silk) is more certain to hold.

Fig. 316. Closing the large vaginal wound left by the formation of the flaps. To permit approximation of the edges of the vaginal wound, it may be necessary to incise the tense tissues, as here shown. After closure of the vaginal wall over the repaired bladder wall, the small lateral incisions may be closed by sutures. The sutures are to be so placed that they change the long axis of the cut to transverse.

The next problem is to cover and reënforce the bladder closure by approximation of the vaginal mucosa over it. The turning in of the flap leaves a large hole in the vaginal wall. To secure approximation of the margins of this opening without tension that would prevent healing, it is necessary to make lateral incisions through the resisting tissues, as indicated in Fig. 316. These lateral incisions should be so placed as not to cut off the blood supply of the approximated wound margins. It is best to employ short incisions, leaving uncut areas of vaginal wall between. Each incision extends through the vaginal wall and also through the submucous resisting tissue. Care must be exercised to see that no incision extends deep enough to wound the bladder wall. This is especially difficult to avoid if there is a great deal of scar-tissue binding the bladder wall to the vagina. After the vaginal wall has been closed over the deep sutures, each lateral incision may be closed by one or two sutures in such a way as to change its length from longitudinal to transverse, as shown in Fig. 316. If necessary, a portion of some of the lateral openings may be left to close by granulation, though it is better if they can be completely closed by suture, as less scar-tissue results.

It is important that the vaginal wall be closed securely over the row of buried sutures, to give proper support to the repaired bladder wound. If there is any difficulty in doing this by the expedient above described, then the more extensive operation of separating the bladder entirely from the vaginal wall by an antero-posterior incision should be employed. The details of this method are shown in Figs. 325 to 328. Only in extreme cases is the transverse incision (Fig. 325) required, and where it can be avoided the closure is more simple and secure, because there are fewer lines of suture.

3. Inaccessible vesico-vaginal fistula. Even a small fistula may prove very resistant to treatment, there being failure after one or more operations, because its location interferes with accurate approximation of bladder wall to bladder wall. Such fistulæ are usually situated about the vaginal vault and are drawn up and fixed by scar-tissue. A typical one, close to the cervix, will be taken for illustration.

The patient, Mrs. J., aged 40, came into the author's service at the Washington University Hospital, February 6, 1913, with a vesico-vaginal fistula of 28 years' standing. It resulted from childbirth in 1885. The labor was long and was terminated by forceps. There was a tear into the base of the bladder, which was repaired at once but did not heal. Patient stated that she underwent operation in 1910, but the sutured tissues sloughed out leaving her worse than before.

All the urine escaped by way of the vagina, leaving the bladder empty and contracted from non-use. The cervix was fixed by the scar-tissue from the deep tear of the vaginal vault. The fistulous opening was situated just in front of the cervix, as shown in Fig. 317, and was firmly bound to the cervix. The large amount of scar-tissue fixed in one mass the cervix, the fistula, the base of the bladder and the adjacent tissues, making the operation exceedingly difficult and the result uncertain.

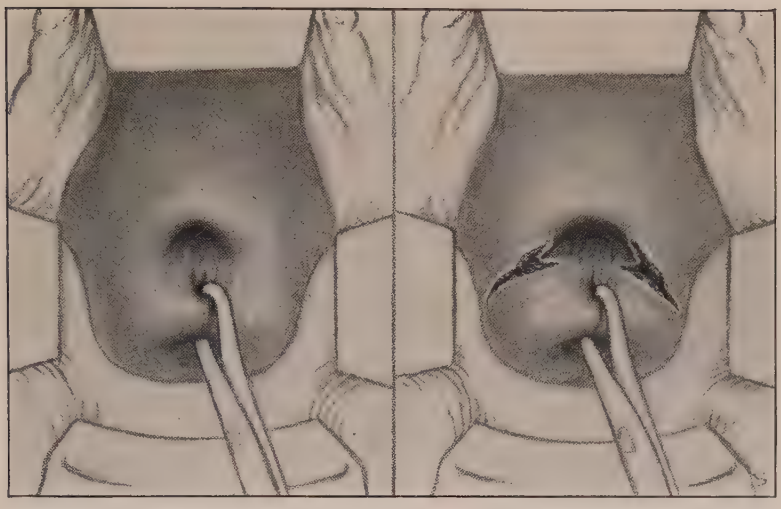


Fig. 317. Fig. 318.

Fig. 317. A vesico-vaginal fistula which was very difficult to repair because of its inaccessibility, due to the high location of the fistula and the extensive scar-tissue about it. The scar-tissue extended into the parametrium around the fistula, obliterating the lines of cleavage between the bladder and the cervix and between the bladder and the vaginal wall.

Fig. 318. Beginning the operation. The vaginal wall is freed from the cervix by the lateral incisions.

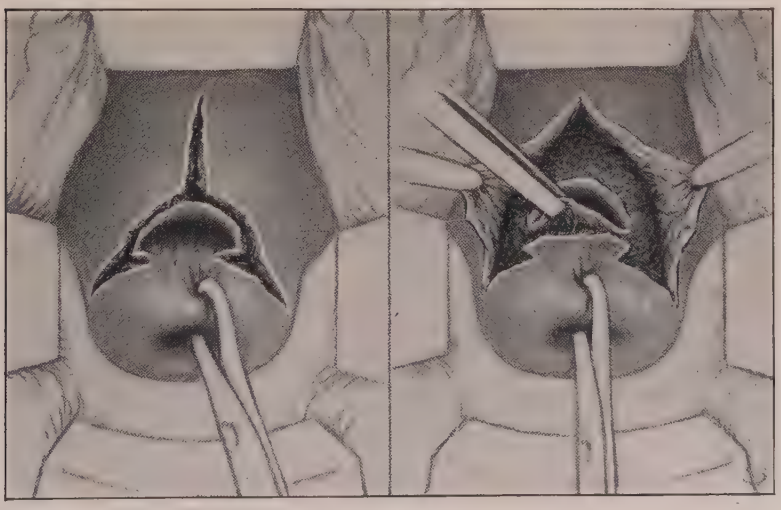


Fig. 319. Fig. 320.

Fig. 319. The incisions extended forward, for freeing the vaginal wall from the bladder.

Fig. 320. The vaginal flap raised from the base of the bladder, and the opening in the bladder freed all around.

The essential feature of successful operation in such a case, is to free the bladder from the cervix and vagina and scar-tissue sufficiently to permit accurate closure of the bladder wall alone without tension. This is so easily accomplished in the normal vaginal vault, that one who has worked only in pliable tissues cannot appreciate what difficulties are encountered in the presence of extensive scar-tissue. In the case under consideration, the vaginal wall was freed from the cervix, as indicated in Fig. 318, and then from the bladder by extending the incisions forward as shown in Figs. 319 and 320. The next step was to free the bladder from the cervix (Figs. 320 and 321). It was with much difficulty that the bladder wall was finally freed sufficiently to permit satisfactory infolding. The opening was closed by a row of double interrupted linen sutures (Figs. 321 and 322). This was reënforced by a continuous suture, as indicated in Fig. 323. The vaginal wound was then closed by catgut (Fig. 324) and a retention catheter placed in the urethra. The wounds healed perfectly. On account of the extensive disturbance, and the contracted condition of the bladder, the retention catheter was kept in ten days. When it was removed, the patient urinated normally without difficulty. Urination was very frequent at first, but the frequency diminished as the bladder capacity increased. The patient left the hospital eighteen days after operation, and returned occasionally for observation. Within the next month she became able to retain the urine for three hours at a time. It was passed without pain or difficulty and in good quantity at each urination (exact amount at last observation not stated in record). Patient went to work and no subsequent disturbance was reported.

For buried sutures, linen or silk is advisable in these cases where the bladder wall is separated extensively from the vagina. It is small in size and holds indefinitely. When well buried in sterile tissues it becomes encapsulated and gives no trouble. Not infrequently, however, it works to the surface in the bladder or in the vagina. But by that time the fistula is well closed and the expulsion of the suture causes only temporary irritation. The fact that this may occur should be kept in mind, and the patient warned to return for examination in case any bladder or vaginal irritation develops. Very small strong full-curved needles (Figs. 322 and 323) are necessary for satisfactory work in adherent tissue deep in the pelvis. The Schuckardt paravaginal incision, described in the radical vaginal operation for cancer of the cervix uteri (Chapter VII), may be employed with decided advantage to give working room in certain cases of deep-seated fistulæ.

4. Vesico-vaginal fistula with excessive scar-tissue union of bladder to vagina. In certain cases the bladder wall and vaginal wall are so firmly united by scar-tissue that no line area of cleavage between them can be found immediately about the fistula. In such a case it is well to begin the separation of the vaginal wall from the bladder some distance away, as suggested by Ward. A long anteroposterior incision is made and the separation is begun forward, well away from the scar-tissue, as indicated in Fig. 325. By means of dissection with the

fingers, as shown in Fig. 326, the vaginal wall is separated at the sides, and then over the fistulous area itself, by working from without inward. If necessary, a cross-incision may be made, as shown in the illustrations. This may or may not be necessary. It complicates the closure.

When the separation has been completed, the bladder opening is closed as

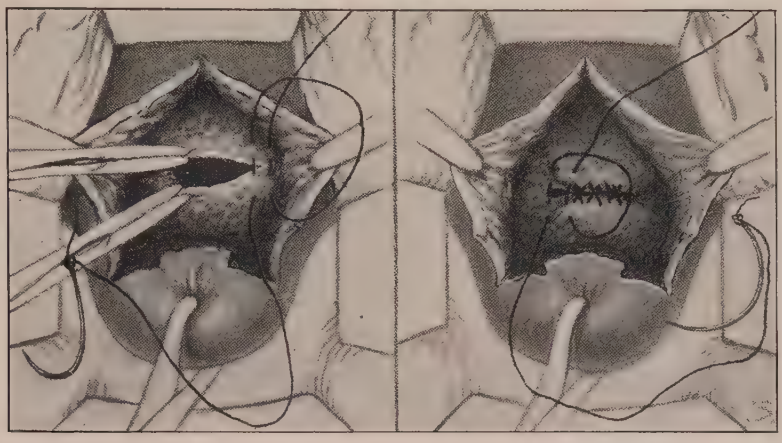


Fig. 321. Fig. 322.

Fig. 321. The bladder wall loosened from the cervix and vagina as far as the scar-tissue would permit. This mobilization of the affected portion of the bladder was secured only after much careful work. The first bladder suture is in place ready to tie.

Fig. 322. The first row of bladder sutures almost completed.

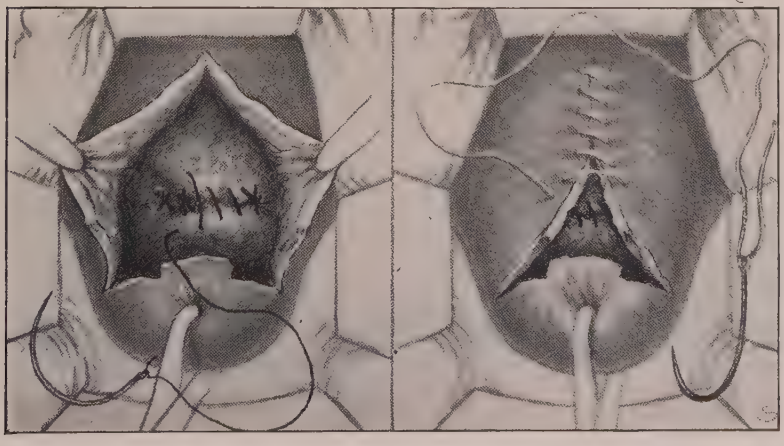


Fig. 323. Fig. 324.

Fig. 323. The second row of bladder sutures nearly finished. This last row may be interrupted or continuous as preferred.

Fig. 324. Closing the vaginal wound. Chromic catgut (40-day) was used for the vaginal sutures.

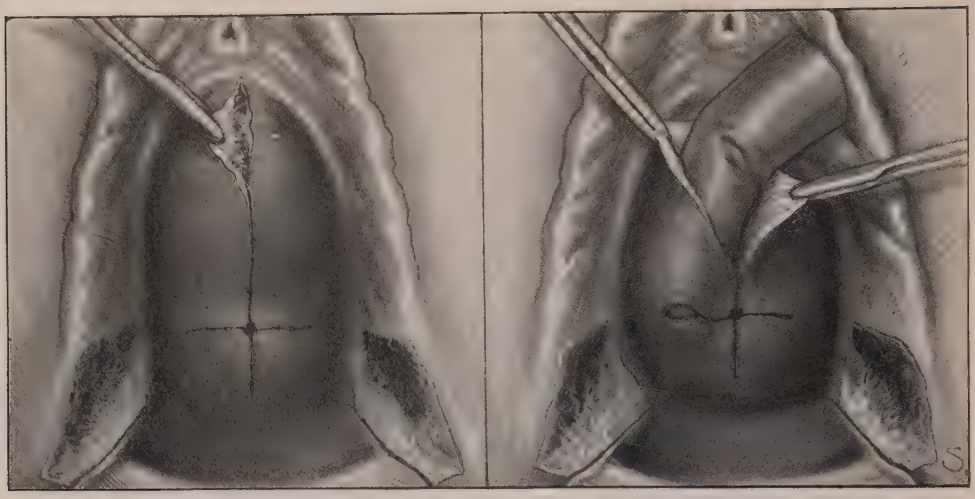


Fig. 325. Fig. 326.

Fig. 325. Vesico-vaginal fistula with extensive scar-tissue union of bladder and vaginal wall. Beginning the effective operation devised by Ward. The long antero-posterior incision is the essential one, the cross-incision being necessary only in extreme cases. The separation of the vaginal wall from the bladder is begun well forward. A double episiotomy, as indicated, may be necessary to give working room.

Fig. 326. The vagina has been separated from the bladder laterally, on the right side, and the separation is being carried toward the fistula by the gloved finger.

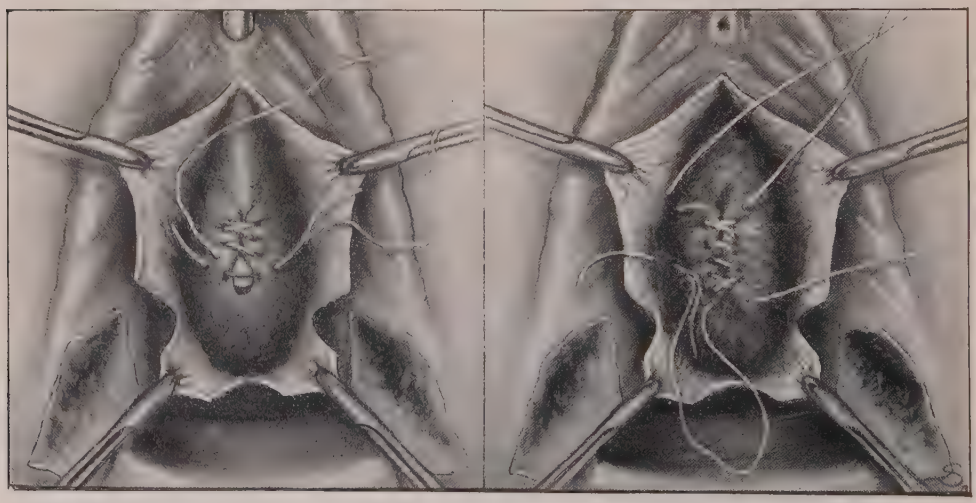


Fig. 327. Fig. 328.

Fig. 327. The bladder wall has been freed extensively and the first row of bladder sutures is being placed. The opening may be closed by continuous or interrupted sutures of catgut or silk, as preferred.

Fig. 328. Before closing the vaginal wound, it is well to place sutures for drawing the repaired bladder wound to one side, as here indicated, so that it will be covered with intact vaginal wall. The vaginal wound is then closed with chromic catgut.

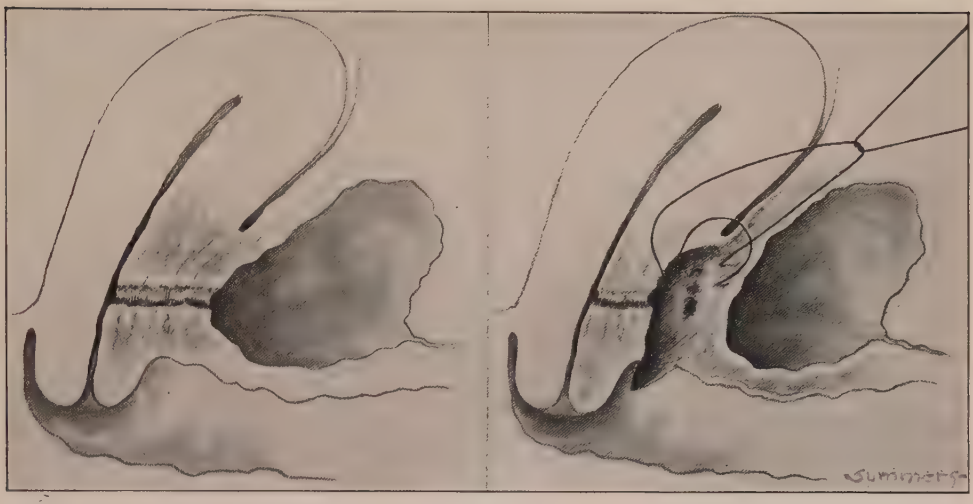


Fig. 329. Fig. 330.

Fig. 329. A vesico-utero-vaginal fistula. The urine passes from the bladder into the cervix uteri and then out into the vagina. This rare condition is ordinarily the result of a laceration involving both the cervix uteri and the bladder. The lower portion of the wound heals, but at the upper part there remains a fistula, through which a portion of the urine escapes.

Fig. 330. Through an incision in the anterior vaginal vault the bladder has been separated from the cervix uteri, and the first bladder suture is in place ready to tie.

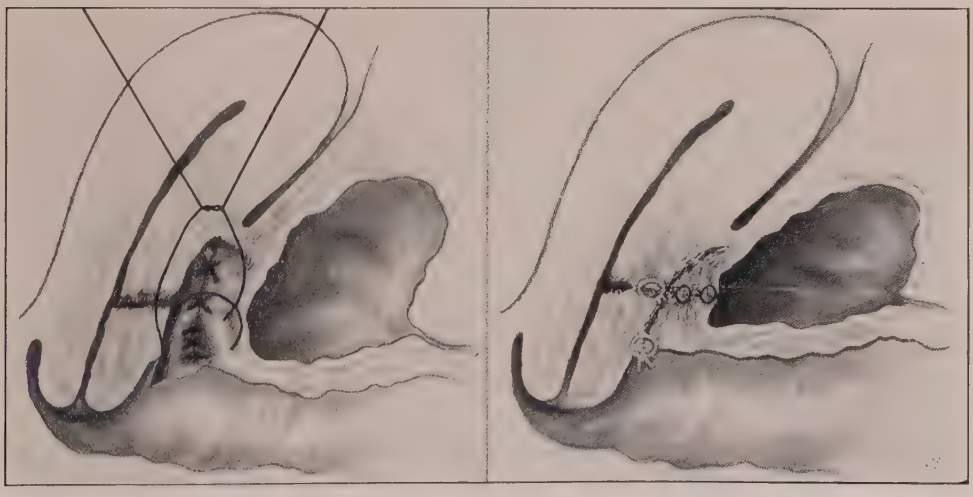


Fig. 331. Fig. 332.

Fig. 331. The first row of bladder sutures is completed, and the last suture of the second row is in place.

Fig. 332. The operation completed. In this situation it is best to use silk or linen for the bladder sutures. Chromic catgut is used for the cervical suture and also for closing the vaginal wound.

indicated in Fig. 327. Absorbable or nonabsorbable sutures may be used, as preferred. After secure suturing of the bladder wall, it is well, if practicable, to draw the sutured area to one side (Fig. 328), so that it will not lie directly under the line of suture of the vaginal wall. The vaginal wound is then closed.

5. Vesico-utero-vaginal fistula. In the case of vesico-utero-vaginal fistula, the urine passes from the bladder into some part of the uterus, usually the cervix, and then into the vagina. Such a condition results from a simultaneous laceration of the cervix and bladder. The lower portion of the torn structures unite, leaving a fistulous tract at the upper portion, as indicated in Fig. 329.

In operative repair, the same principle holds here as elsewhere, namely, thorough separation and mobilization of the bladder wall so as to permit separate suturing of the same. Fig. 330 shows the bladder wall separated from the cervix, and the first buried suture in place and ready to be tied. The direction of the line of suture is of no special importance, except that it should in each case be placed so as to effect the closure without tension. Hence, the direction will vary in different cases, with the character of the opening and the distribution of the scar-tissue. If practicable, it is well to put in two rows of sutures, as shown in Fig. 331. It is not necessary to close all the tract in the cervix, though it is advisable to curet the tract and then close the outer portion by a suture as indicated in Fig. 332. This serves to protect the bladder sutures from uterine secretion, which otherwise would pass along the tract into the wound area. If the sutured area heals, the inner portion of the cervical tract will close by granulation. The cervical tissue and also the vaginal wound are preferably sutured with catgut (Fig. 332).

6. Inoperable vesico-vaginal fistula. In those cases where surgery cannot close the fistula, the intolerable itching and distress from the constant dribbling of urine may be overcome by diverting the stream of urine to the rectum, thus substituting the rectum for the bladder as the urinary receptacle. There are two methods of accomplishing this—first, the ureters may be switched from the bladder to the rectum or, second, the urine may be conducted from bladder to the rectum, thus leaving the uretero-vesical junctions intact.

The latter plan is the preferable one. The former plan (implantation of the ureters in the rectum) has been the subject of much experimental and clinical work, particularly in connection with bladder extirpation for malignant disease. The results have not been satisfactory. Practically all the patients have died sooner or later of kidney infection. On the other hand, kidney infection seldom follows the vesico-rectal method of diverting the urine to the rectum. Peterson has written a most instructive article (Surgery, Gynecology and Obstetrics, Oct., 1917) on this subject, summing up his own work and also conclusions to be drawn from all reported cases. The situation in regard to diverting the urinary stream to the rectum, for incurable incontinence of urine, is well stated in the following quotation from the article:

"*Nature of the Defect.*—The nature of the lesions giving rise to the incontinence varied from vesico-vaginal fistulæ with more or less complete destruction of the vesico-vaginal septum to lesions where the urethra was partially or wholly destroyed with fistulæ involving the recto-vaginal septum. In 10 cases there were vesico-vaginal-rectal fistulæ, while in 13 cases there was complete destruction of the urethra. In two cases in addition to other defects there were complete tears of the perineum.

"A study of the cases will show that most of the operations were performed for most serious conditions of the soft parts after plastic operations had been tried and failed, except in those instances where restoration of function was hopeless from the start because of loss of the vesical sphincter. This brings up the question of how many operations a patient should be subjected to when there is failure of plastic procedures. After a fair trial has been made and very little has been gained, the patient should have the procedure under discussion explained to her, as she may prefer it to repeated trials with very little hope of success. In a way, every case of the operation we are considering is a confession of failure. It is not and never will be an ideal procedure. At the most it is merely a way out of a serious difficulty. Especially is it objectionable since it precludes copulation, a vital objection in the case of the married woman. On the other hand, where the parts are intensely irritated by urinary and fecal discharges, intercourse is just as much interdicted while in the one case the woman has great suffering and in the other she is able to have a fairly comfortable existence.

"*Technique of the Operative Procedure.*—As the procedure in the great majority of cases is for the relief of urinary incontinence due to a vesico-vaginal fistula, the formation of the latter as a part of the operation is reserved for those cases like my first one, where the vesical sphincter is impaired by the removal of malignant tissue. It must be borne in mind that these artificially made vesico-vaginal fistulæ must be large enough to allow for subsequent contraction. One does not hesitate to remove enough tissue from the vesico-vaginal septum to prevent the consequences of such contraction, the formation of vesical calculi, which were reported in four cases. As a further aid toward preventing contraction, the vesical and vaginal mucous surfaces about the fistula should be united by interrupted catgut ligatures.

"The same warning holds true for the artificial recto-vaginal fistula. It should be made just above the internal sphincter muscle, longer longitudinally than laterally but large enough to admit two fingers easily. The two mucous surfaces should be united by chromicized catgut or silk sutures. Spinelli worked out on the cadaver a somewhat elaborate technique for the formation of the recto-vaginal opening, designed to prevent feces from being forced into the vagina and giving at the same time easy passage for the urine into the rectum. As a matter of fact such technique is unnecessary, since a study of the reported cases shows that a natural valve is formed after the making

of a simple opening into the rectum so that feces do not flow into the vagina; consequently, this accident need not be guarded against.

"A drainage tube was used in the rectum in 9 cases. I very much doubt the necessity for its use and in another case I would dispense with it altogether depending upon thorough paralyzing of the sphincter muscle by stitching and the occasional passage of the rectal catheter. A drainage tube even within the rectum causes considerable irritation, much more so if it be passed into the bladder by way of the rectal and vesical openings.

"In 15 cases the operations were performed in two stages, the fistulæ, vesical and rectal, being made first and the vagina subsequently closed. The advisability of the two-stage procedure will depend upon the nature of the case, being probably necessary in the presence of great irritation. However, in the majority of cases a one-stage operation will suffice and give just as good results.

"*Mortality of the Operation.*—Since the peritoneal cavity is not involved either in the formation of the vesico-vagino-rectal fistula or in the closure of the vagina there should be no primary mortality connected with the operation. This is borne out by the study of the cases since in only one instance, Maisonneuve's case, where the patient was operated upon in 1851 did death occur directly from the operation. This patient died of a septic phlebitis, a result easily avoided today. One of Morisani's patients died on the eighteenth day of pneumonia, apparently unconnected with the operation. One of Rose's patients died ten months after the operation from nephritis which an autopsy showed did not result from the operation. Another of Rose's patients died about nine weeks after the operation which was performed for incontinence following the removal of the clitoris, urethra and the entire vesico-vaginal septum. Death resulted from uræmia due to pressure of malignant metastases upon the ureters.

"Therefore it may be concluded that the operative procedures are not dangerous; hence are justifiable for the relief of conditions which in themselves do not threaten life.

"*Healing after the Operation.*—It is exceedingly difficult to secure primary union of the colpocleisis portion of the operation as shown by the fact that in only two instances did this part of the wound heal by first intention. The resulting fistulæ, however, heal rather readily after the application of caustics since there were only 6 cases of persistent fistulæ. That precautions must be taken against contraction of the recto-vaginal opening is shown by the fact that such a contraction was mentioned in 9 cases.

"*Functional Results.* Experimental work and a study of the reported cases show that the rectum can be used as a substitute for a urinary bladder without giving rise to rectal irritation. In not a single case of the 41 was such irritation reported. The urine does not give rise to uncomfortable diarrhea, although the stools are somewhat softened by the urine. At times small amounts

of liquid feces are passed with the urine. Usually, however, there are one or more formed stools a day in addition to the passage of the urine at frequent intervals. In 5 cases the patients were reported as being constipated.

"The length of time between the rectal urinary evacuations was mentioned in 23 cases. The urine was retained between two and three hours in 5 cases, while in 1 case each it was held for one hour, six, and between six and eight hours. It is very possible that highly concentrated urine would cause a certain amount of irritation of the rectum and lead to increased evacuations, but such a condition of affairs could easily be overcome by a medicinal treatment.

"Considerable interest centers about the menstrual function after the operation. Since most of the women are at the child-bearing age and are menstruating regularly at the time of the beginning of the incontinence, the menstrual blood must either pass by way of the anus or be retained within the uterus. In 12 cases the women menstruated after the operation through the rectum without apparent inconvenience while in 9 cases menstruation ceased after the operation without apparent cause unless it could be explained as due to the trauma giving rise to the vesical defects. Whether menstruation ceased or persisted there was no particular reason to fear colon infection of the endometrium from fecal contamination through the recto-vaginal opening. In the first place usually the vagina is free from feces and, secondly, cases where there are extensive recto-vaginal fistulæ with a bathing of the cervix with fecal matter do not result in infection of the uterus.

"The steps necessary to be taken where there is retention of menstrual blood from adhesions about the os have already been considered.

"*Ascending Renal Infection.* There was absolutely no proof that the formation of the cloaca resulted in ascending renal infection. In my first case the urine was collected, examined, and found normal. The only doubtful case, already mentioned, was one reported by Rose in which the patient died of nephritis ten months subsequent to the operation. However, Rose had in mind the possibilities of ascending renal infection and says distinctly in the report of the case that the autopsy showed that death was not due to anything connected with the operation. Again let it be stated that this freedom from ascending infection is undoubtedly due to the fact that the ureteral orifices have not been interfered with and that very few colon germs find their way into the bladder."

CHAPTER V.

INFLAMMATORY AND NUTRITIVE DISEASES OF THE UTERUS.

The operative treatment of inflammatory and nutritive diseases of the uterus will be taken up under the following heads:

CERVIX UTERI.

Excision of Specimen from Cervix.
Curettage of Cervix.
Linear Cauterization of Cervix.
Repair of Laceration of Cervix.
Regular Amputation of Cervix.
Amputation of Cystic Area of Cervix.

CORPUS UTERI.

Curettage of Corpus Uteri.
Hysterotomy.
Resection of Uterus.
Hysterectomy.
Radium Treatment.

EXCISION OF SPECIMEN FROM CERVIX.

The two important factors in saving a patient from death from malignant disease are, first, early diagnosis, and second, prompt and thorough operation. Early diagnosis of cancer of the cervix depends on microscopic examination of excised specimens. If the diagnosis is delayed until clinical symptoms and signs clearly indicate the nature of the trouble, the outlook, with even the most radical operation, is not good.

Question of Metastasis from Specimen Excision.

Reference must be made to the question of the probability of metastasis from the excision of a specimen from a cancerous area. There seems at present to be considerable hysteria on this subject, mounting in some quarters to a phobia in which the attention is focused on a single phase of the subject to the exclusion of other and more important phases. This serious condition is due largely to certain leaders in the profession who have permitted themselves to make loose statements, too sweeping in character or so ambiguous in construction as to promote erroneous interpretation.

There is unquestionably some danger in any incision, in spite of all the precautions of modern surgery. Specimen excision and uterine curettage are no exception to the rule. In a cancerous area there are cancer cells and usually infectious bacteria, consequently particular care should be taken to immediately seal opened lymph and blood vessels by thermic or chemical cauterization. With this precaution, I am satisfied that the danger of specimen excision or uterine curettage in a doubtful case is far less than the danger of not making such diagnostic excision or curettage.

For years gynecologists have been fighting for early diagnosis in uterine cancer. One of the essential features of such early diagnosis is microscopical examination of tissue removed for that purpose in doubtful cases. Many women who are alive today owe the preservation of life to such early microscopic diagnosis. And others have been saved through the differentiation of their troubles from malignant disease, thus preventing a serious and necessarily often fatal operation. As before stated, there is some danger in any excision of tissue, but under proper precautions the danger of excision is so slight and the danger of delay so great, that to neglect this decisive diagnostic measure is to neglect a serious duty we owe to the patient. Furthermore, the evidence, at least the evidence that has come to my notice, indicates that the principal danger of an examination promoting distant metastases or peripheral extension from a malignant growth, comes not from specimen excision but from the manipulation and squeezing of the growth. In an instructive article by Wood (Journal American Medical Association, Sept. 6, 1919) substantial experimental evidence is introduced. He found in animal experimentation that metastasis is increased, first, by the length of time the tumor is in the body, and second, by massage of the tumor. Diagnostic excision of tissue without massage had no appreciable influence in that direction. He concludes as follows:

"It is evident that this experiment demonstrates that in white rats bearing the Flexner-Jobling rat carcinoma, or the Crocker Fund rat sarcoma No. 10, metastasis is not increased when the tumor is incised, a fragment removed aseptically, and the growth allowed to remain in the animal for from ten to twelve days thereafter.

"It permits the deduction also, that human tumors are probably not widely distributed by incision, as has been thought, and that, therefore, when these tumors are situated in such portions of the body that a mutilating or highly dangerous operation is necessary for their removal, they should be examined microscopically if such a diagnosis can be made in no other way.

"It is preferable that such diagnosis be made immediately by frozen section, if facilities are available, so that if necessary the operation can be continued under the same anesthesia; but the patient's future is not necessarily compromised if a small fragment is removed, the wound closed, and the operation proceeded with the moment a microscopic diagnosis is obtained.

With modern rapid methods of preparation of sections, the lapse of time need not be more than three or four days."

The working conclusions of the author on this subject are as follows:

1. If in a doubtful case excision of tissue from the cervix or intrauterine curettage is necessary to an early differential diagnosis, it should be carried out at once, without unnecessary manipulation of the growth, and the opened lymph spaces should be immediately closed by thermic or chemical cauterization.

2. The effort to limit such diagnostic excision or curettage to patients on the operating table and prepared for radical operation, is doing harm. It excludes from early differential diagnosis that large class of doubtful cases in which the local disturbance is very slight and the patient hesitates to go through the expense and mental strain of preparation for the radical operation on the mere chance that there may be beginning malignant disease. And yet it is in just this very early class that differential diagnosis is most effective in saving life.

The pernicious teaching mentioned above is producing deaths by cancer not only by limiting diagnostic excision in the earliest cases, but also by leading to repeated manual examinations and manipulation of the suspicious area, in an effort to decide the diagnosis without tissue excision. Both reason and experimental evidence indicate that pressure manipulation of a cancerous area is much more productive of metastasis than simple excision of tissue or curettage with proper precautions.

Indications for Specimen Excision.

When the cervix presents any departure from the normal, malignant disease must be definitely and certainly excluded. The method of exclusion varies in different cases, depending on the conditions present. In some cases, excision of a specimen of tissue is necessary, in others it is not necessary. The point is, that by some means, the differential diagnosis must be made with certainty within a reasonable time. There must be no temporizing and aimless "local treatment" of uncertain lesions in this region of danger. The prompt differentiation of a suspicious lesion in this locality is so important a matter that it is advisable to emphasize it by giving here the details of such differentiation.

Malignant disease is invariably *chronic* and there is always present either *induration* or *ulceration.*

The *chronicity* of the trouble does not mean that the patient has had symptoms for a long time—she may come to the physician at the first noticeable symptom. The term is used simply in its pathological sense, that is, to indicate that the lesion, on examination, presents the characteristics of slow development, instead of the characteristics of rapid development, such as are seen in inflammation or injury.

If there is *induration* in the cervix, it can be felt. If there is *ulceration* or

erosion of the outer surface of the cervix, it can be seen. If there is ulceration within the cervical wall, it will cause a *discharge.*

Induration in the Cervix. Induration in the cervix may be due to cystic disease or to scar-tissue from laceration or to a fibroid or to malignant disease.

In *cystic disease,* if the nodule be punctured and then pressed upon the characteristic clear glairy substance will be extruded and the induration will largely disappear. If there remains enough induration to make the diagnosis doubtful, excise a small wedge-shaped piece and submit it to a pathologist for examination.

In *scar-tissue* from laceration, the induration is limited to the site of injury and the cause is plain. Also, in scar-tissue the area of induration remains practically the same, whereas if malignant the area of induration gradually increases. In this case, as in every other, if there is reasonable doubt after a short period of careful observation, excise a piece for microscopic examination.

In *fibromyoma* of the cervix, fibroids elsewhere in the uterus may often be detected, making it probable that the nodule in the cervix is similar in nature. A well-marked tumor of the cervix, even a fibromyoma, should be removed, for almost without exception a fibroid in that situation causes very troublesome symptoms. A small mass with no fibroids elsewhere should have a piece excised to make certain the diagnosis.

Ulcer or Erosion on Cervix. An ulcer or a spot of erosion on the cervix may be due to an irritating discharge, to a pessary or other irritant, to eversion of the mucous membrane by laceration, or to tuberculosis, syphilis, chancroid or cancer. In the first two mentioned the lesion heals promptly on removing the cause.

Where the *cervix is torn* so deeply that the mucous membrane is everted and granulating, the cervix should be repaired, and the tissue removed in the denudation for repair may be examined microscopically. If there is no malignant trouble, the cervix will be in much better condition than before, and we will have satisfied ourselves that it was only simple trouble and the patient need never know that there was a suspicion of malignancy. If malignant infiltration is found in the excised tissue the uterus can be removed at once with the probability of a permanent cure.

Tuberculous ulceration of the cervix is rare. The diagnosis is made from microscopic examination of pus and scrapings from the diseased area.

In *syphilitic ulceration* there are usually other lesions or a history which makes the diagnosis clear. In a doubtful case examination for the spirochetæ or the Wassermann reaction may be employed. Furthermore, a syphilitic lesion of the cervix, whether primary, secondary or tertiary, should yield within a reasonable time to appropriate treatment, provided the patient's general health is not too much depressed.

Chancroidal ulceration which is thoroughly cauterized should, within a short time thereafter, show healthy granulation and rapid healing. A sore on the cervix that resists appropriate treatment should have a piece removed for examination.

Differentiation by copper sulphate solution. The following method of differential diagnosis between suspicious areas on the cervix has been proposed: Soak pledget of cotton in ten per cent copper sulphate solution and apply it, for a minute or two, to the suspicious surface. If the lesion is a simple erosion, a bluish-white coating will form without hemorrhage. By repeating the application at intervals of three or four days the erosion will soon be healed. If the lesion is an ectropion it will be blanched by the application. If the lesion is cancerous ulceration, the copper sulphate application will cause bleeding. A few days later another application is made, and if the bleeding is more free the diagnosis of incipient carcinoma is almost certainly correct. Heitzman, who brings forward this method, states that he rarely failed to find microscopic confirmation of this provisional diagnosis. In all ulcerations except malignant, the bleeding is checked by the copper sulphate solution in a few applications, and the persistence of a single bleeding point after the rest of the raw surface is healed indicates malignancy and calls for a microscopic examination of tissue from the suspected area.

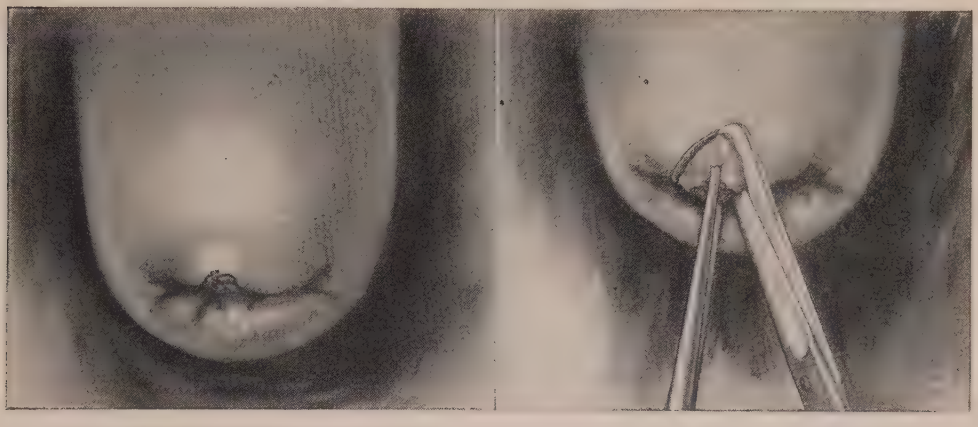
Technique of Specimen Excision.

A small piece of tissue may be clipped from the cervix in the office, or a piece may be excised in connection with curettage in the hospital. In either case, the open lymphatics in the resulting wound should be at once sealed by cauterization with a chemical cautery (carbolic or nitric acid or zinc chlorid) or with a thermic cautery (electric cautery or Paquelin cautery or soldering iron).

In the Office. The cervix uteri is not very sensitive and, unless the patient is very nervous, a small piece of the suspicious area may be clipped without much disturbance. If there is a projecting area it may be caught with a tenaculum-forceps and a cut made on each side with a knife or scissors, as shown in Fig. 333. The notched scissors, shown in the illustration, are very convenient for this purpose in that the point fixes the tissue and prevents it slipping away as the cut is made. The scissors are shown in detail in Fig. 334. A small wedge-shaped piece is excised, including affected tissue and some of the underlying tissue. Ordinarily this disturbs the patient very little. If the patient is nervous or the cervix unusually sensitive, some novocaine solution (two per cent) or cocaine solution (one-half per cent) may be injected into the area with a hypodermic syringe.

As soon as the specimen is removed, the wound should be wiped dry, and a small pledget of cotton moistened with carbolic acid applied and worked into every portion of it. The carbolic acid is left there for a minute, the vaginal wall being protected from any excess that may escape. If desired, the excess of carbolic acid may then be neutralized with alcohol. If there is still considerable bleeding, a small pledget of cotton soaked in adrenalin solution (1-1000) may be applied with pressure for a minute or two. If this controls most of the bleeding, a fresh adrenalin pledget is applied, some antiseptic astringent powder dusted in

and one or two tampons introduced to make pressure against the cervix. If there is free bleeding not controlled by the adrenalin application, it may be easily controlled by a catgut suture, introduced with a small sharp full-curved needle. After the excision of tissue, the patient is instructed to go directly home and lie down for the rest of the afternoon. The small specimen is, without forceps-



A. *B.*

Fig. 333.

Fig. 333. Excising a Specimen from the cervix for microscopic examination. *A*. The suspicious area, presenting an induration and a small spot of ulceration. *B*. The area grasped with a tenaculum-forceps, and being excised with scissors. The scissors here shown have the hooked blades, which prevent the tissue from slipping away. These special cervix scissors are shown in detail in Fig. 282.

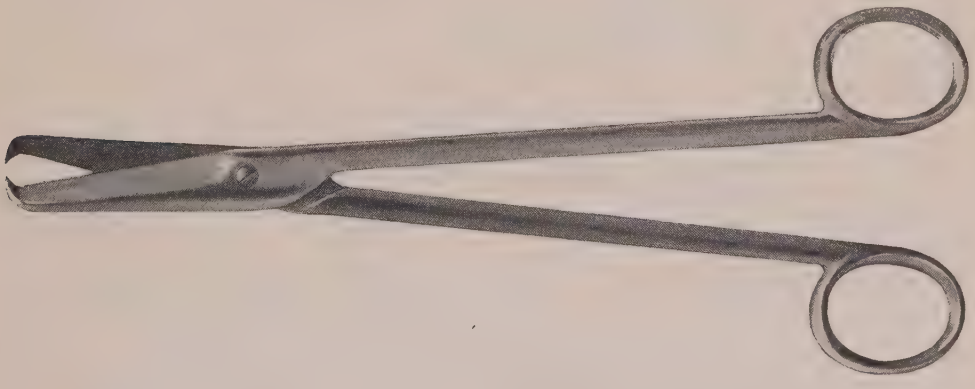


Fig. 334. Special cervix scissors. The hooked blades hold all the tissue first grasped so that none of it can slip away as the scissors are closed. They are very convenient for excising a small wedge of tissue from the firm resisting cervix.

compression or other handling, dropped into a bottle of ninety-five per cent alcohol or ten per cent formol, and sent to the pathologist.

The excision of a specimen from cervix is much facilitated by specimen scissors with which the tissue may be clipped out at one bite. Figs. 335 and 336

show the small strong hawk-bill scissors, which the author has used for this purpose for several years. It is a throat instrument (Myles' hawk-bill tonsil punch) but is admirably adapted for securing specimens from the cervix uteri. It is powerful enough to cut through the dense tissue of the cervix, and the hawk-bill point on the upper blade fixes the desired area and prevents its slipping away as the scissors are closed. Figs. 337 and 338 show the small scissors (nasal cutting forceps) which the author has long used with satisfaction for obtaining specimens from within the cervix. This instrument is not powerful enough to cut through dense tissue, but easily cuts through soft tissue and is

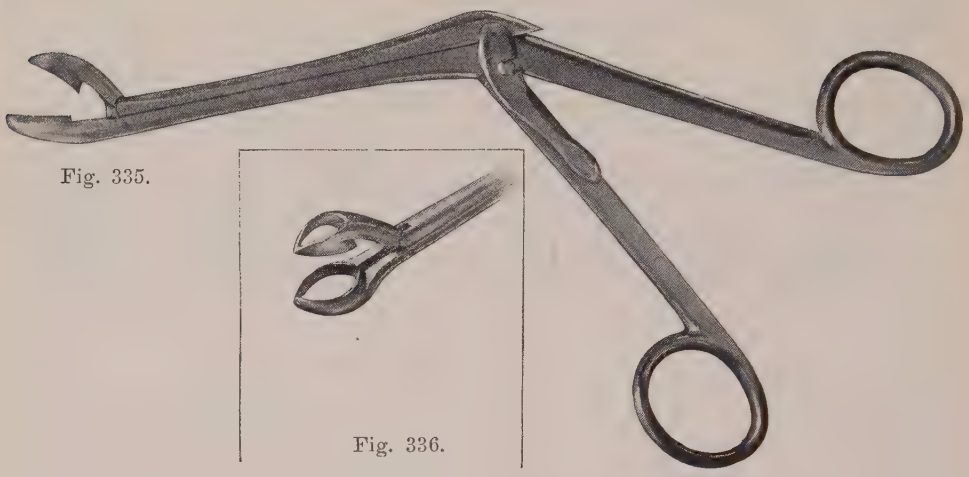


Fig. 335.

Fig. 336.

Fig. 335. A convenient specimen scissors for clipping small pieces from the cervix uteri. It is a throat instrument (Myles tonsil punch) which the author has used for several years for excising small specimens from the cervix.

Fig. 336. The details of the cutting portion of the instrument shown in Fig. 335. The hawk-bill points fix the portion of firm tissue to be excised and prevent it slipping away as the scissors are closed.

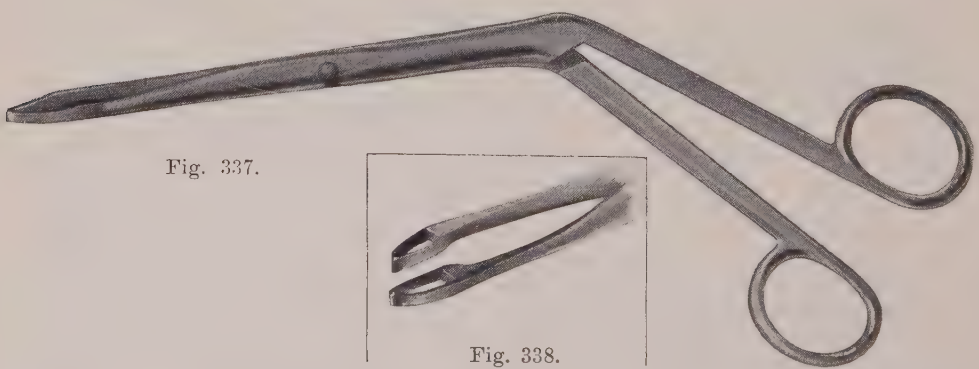


Fig. 337.

Fig. 338.

Fig. 337. A small instrument (nasal cutting forceps) which the author has found convenient for obtaining specimens from within the cervix. It is not so powerful as the hawk-bill forceps shown in Fig. 323, but it readily cuts through soft tissue and is small enough to be introduced some distance into the cervical canal.

Fig. 338. The details of the cutting portion.

small enough to be introduced some distance into the cervical canal. Figs. 339 and 340 show the specimen scissors with circular cutting edges, devised by Dr. W. C. Gayler. The lock is placed near the cutting end, making the scissors powerful enough to cut through dense tissue. This instrument should prove satisfactory in many cases. In most cases, however, a hawk-bill point is decidedly advantageous, to fix the area to be excised and prevent it slipping away as the scissors are closed.

In some cases, simple scraping with a curet will remove papillary masses sufficient for microscopic examination. As a general proposition, however, the diagnosis should be made before this stage is reached.

In the Hospital. In some cases in which a specimen is to be excised from the cervix, there are also indications for therapeutic or diagnostic curettage.

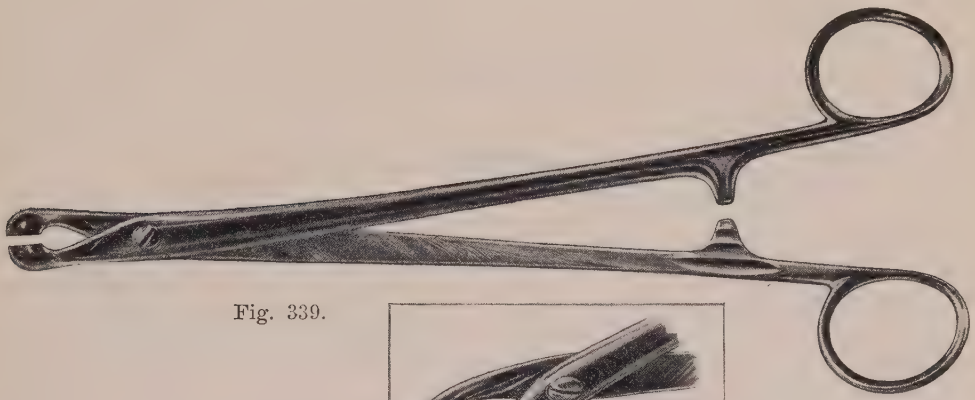


Fig. 339.

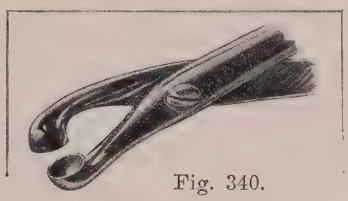


Fig. 340.

Fig. 339. The Gayler specimen scissors. The lock is placed near the end and the scissors are powerful enough to cut through dense tissue.

Fig. 340. The details of the cutting portion.

Again, deep pelvic palpation under anesthesia is not infrequently required, to determine the character and attachment of a mass or to determine the question of operability if malignant. In such a case the excision of tissue from the cervix may be quickly carried out after the other work is done. A point to be kept in mind is prompt sealing of the lymph spaces of the wound by chemical or thermic cauterization as previously explained.

In certain cases the curettage and excision of tissue from the cervix require only local anesthesia or, in rare cases, no anesthesia. If the patient is nervous and apprehensive, general anesthesia is advisable. If deep pelvic palpation is required, full anesthesia is of course necessary to give the essential muscular relaxation.

CURETTAGE OF CERVIX.

The curettage here referred to is vigorous therapeutic curettage of the interior of the cervix for chronic endocervicitis.

In certain cases chronic inflammation persists within the cervix for months and years, in spite of douches and local applications and internal medication.

The principal symptom is the annoying leucorrhea. A considerable proportion of the patients complain of severe and persistent backache. Backache varies greatly in etiology, but in some of these cases it is evidently due to the endocervicitis for it disappears on correction of the same.

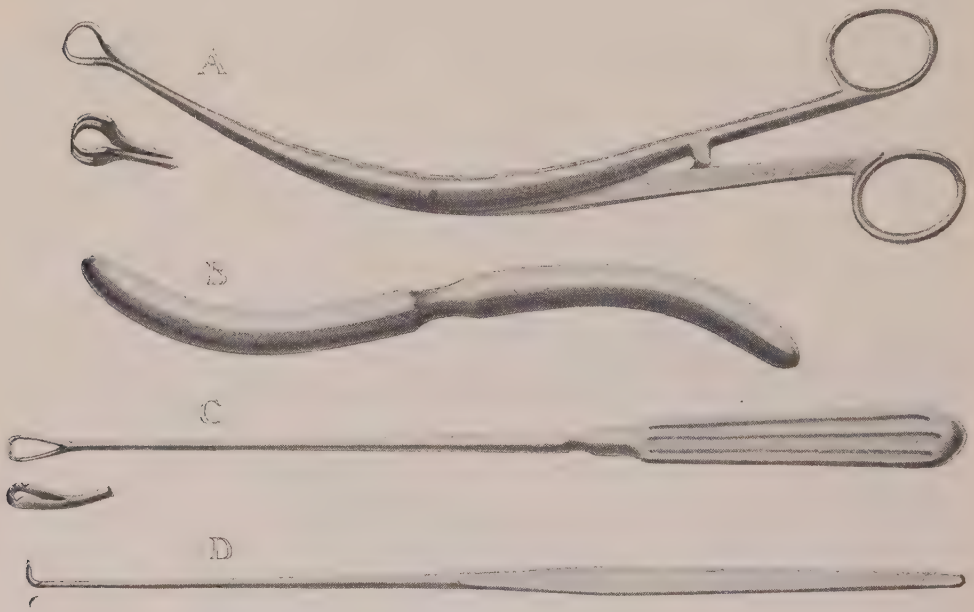


Fig. 341. Substitute instruments for cervical curettage. *A*. Curved tenaculum-forceps, by which the anterior lip of the cervix may be firmly grasped, the curve permitting the handle to be held up out of the way. *B*. Ordinary uterine dilator, which is to be introduced only to the internal os—not through it. *C*. Small uterine curet which has been notched and sharpened with a file, so that it will take hold of the tough cervical mucosa. *D*. A tenaculum which has been filed so that it forms a small angled knife, used in persistent cases to incise the interior of the cervix from the internal os to the external os and thus open deep-seated cysts missed by the curet.

The chronic inflammation may be limited to the cervix or it may involve the endometrium also, or it may be still more extensive, involving the tube and surrounding structures of one or both sides. When the inflammation is extensive, the cervix curettage is simply an incident in the more extensive operative work required. The cases considered here are those in which the inflammatory process is limited to the cervix wholly or largely, and consequently treatment of the cervix is all that is required. Limitation of the process to the cervical mucosa is indicated by the character of the discharge, which consists mainly of tenacious mucus, colored by dead leucocytes, and by the absence of symptoms of

endometrial or tubal involvement, such as excessive menstruation or pelvic pain and tenderness,

Curettage of the cervix may be executed with the ordinary instruments shown in Fig. 341. In patients that are not nervous, it may be carried out in the office, some cocaine crystals being placed in the cervical canal before dilatation. In some cases the chronic cervical discharge is cured by vigorous cervical curettage accompanied by incisions with the small tenaculum-knife to open deep-seated cysts. In other cases the discharge persists as before.

LINEAR CAUTERIZATION OF CERVIX.

This treatment, devised by Hunner, is for persistent chronic endocervicitis, without much laceration or cystic formation. Where there is decided laceration and extensive formation of cysts, resection of the cervix (partial amputation) is preferable. Linear cauterization may be made in the office and, like cervical curettage already described, it has proved very effective in curing chronic inflammation within the cervix, with its attendant leucorrhœa and irritation and sterility.

Technique.

With the patient in the dorsal position, the cervix is exposed with a speculum which separates the vaginal walls widely and holds them well away from the cautery. A trivalve speculum is most satisfactory. The exposed cervix is then surrounded with gauze to protect the vaginal vault, and the cervix is grasped and held by a tenaculum-forceps. The slender cautery point, heated to a bright red, is then introduced into the cervical canal, pressed firmly against one side and slowly withdrawn. This produces a line of cauterization extending through the diseased mucosa. Two or three linear cauterizations are thus made, completing the treatment for that time.

These treatments must be repeated every ten days or two weeks, sometimes over a period of several months. The repeated cauterization and the length of time required constitute a decided objection to this form of treatment.

Kelly has sought to lessen the number of treatments by cauterizing more extensively, so extensively as to practically destroy the cervical mucosa. This thorough cauterization requires a general anesthetic. It may have to be repeated once or twice and carries the danger of cicatricial disturbance in the cervix.

Noble endeavored to attain the same result by multiple incisions with a knife. Five or six incisions were made from the internal os downward and extending deeply through the cervical mucosa into the underlying tissue. This incision-treatment escapes the extensive mucosa destruction and scar formation of cauterization, but it leaves untouched a large portion of the diseased mucosa.

The subject of linear cauterization of the cervix has been presented most helpfully by Dickinson (Am. Jour. Obst. and Gynec., December, 1921). With

the small tip, two or three fine lines of cauterization are made on each everted lip. These are repeated at intervals of one or two weeks, giving time for the reaction to subside between treatments. These treatments are repeated until all cysts are destroyed and the eversion and swelling of the cervix have largely disappeared. This linear cauterization with the small nasal tip usually disturbs the patient very little and can be carried out as ordinary office work. It presents the advantages of the more severe Hunner cautery treatment with the disadvantages of anesthesia.

If the condition is too severe for these treatments or is likely to persist in spite of them, then repair of the cervix (trachelorrhaphy) or excision of the cystic area is required.

REPAIR OF LACERATED CERVIX.

(TRACHELORRHAPHY.)

The *indications* for repair of a lacerated cervix, or trachelorrhaphy, lie not so much in the laceration as in the complications. A cervix may present two distinct lips with a deep notch between, and yet if there is no inflammation of the cervix (indicated by hypertrophy, cystic formation, discharge and erosion) and no everted, irritated mucosa, there is no occasion for operation. In many cases, the symptoms attributed to lacerated cervix are due largely or wholly to other conditions.

On the other hand, a cervix that is causing much trouble may present no notch and no distinct lips, but appear as a round ball. Some of the worst cases present this ball-shaped cervix (Fig. 342). The shape is due to retraction and inflammatory infiltration which has produced complete eversion of the torn portion and consequent obliteration of distinct lip outlines. That this is the condition may be demonstrated by catching the point representing the external os on each side with tenaculum-forceps, as shown in Fig. 343, and bringing them together or as near together as possible. The chronic inflammation of the cervix usually extends higher, also, giving rise to a free discharge, as shown in Fig. 342.

A cervix that is the seat of chronic irritation should be subjected to effective operation (repair or resection) because of the accompanying troublesome symptoms and also because of the menace of malignant disease as the menopause approaches.

Preparation for operation. When the operation must be postponed for a time, the cervix may be subjected to preparatory treatment as follows:

a. Give a hot antiseptic douche two or three times daily.

b. Puncture the cysts and touch the cavities with strong silver nitrate solution or other antiseptic.

c. When there is marked congestion and infiltration, bleed the cervix by multiple punctures once or twice weekly. Draw one or two tablespoonfuls of blood each time and follow the bleeding by a tampon soaked in boroglyceride or

ichthyol-glycerin. Direct the patient to remove the tampon in twelve to twenty-four hours and then continue the hot douches until the next office treatment. By this method the cervix may, in the course of a few weeks, be reduced considerably in size and put in much better condition.

d. Treat the complications, such as retroversion and endometritis.

e. Give laxatives and tonics as necessary to put the patient in good condition generally.

Before operating for repair of the cervix the patient should be carefully examined, that all lesions present may be determined and taken into consideration in the treatment and prognosis. It may be found that the laceration of the cervix is only a small part of the patient's trouble and that her principal symptoms are due to malposition of the uterus or to loss of support in the pelvic floor or to endometritis or to salpingitis or to appendicitis or to a pelvic tumor. Many bitter disappointments and so-called failures have followed this operation, and other operations also, because the operation was expected to remove symptoms that were really not dependent on the lesion attacked. Such a mistake may be avoided by examining the patient carefully, and giving to each lesion present its due importance in the production of the complex clinical picture.

Another reason for ascertaining carefully all lesions present is that some other lesions may be corrected at the same time that the cervix is repaired, for example, the uterus may be curetted or a malposition corrected or the pelvic floor repaired.

In preparing for the operation on the cervix avoid the menstrual flow for ten days after the operation—the best time for the operation being four to ten days after menstruation.

The antiseptic preparation of the patient is the same as for any vaginal operation. These preparations for vaginal operation are given in Chapter XVII and the instruments also are listed and illustrated there.

Technique.

After the patient is anesthetized and brought to the edge of the table and the antiseptic preparation carried out, the operator proceeds by the following steps or rules:

1. Make a careful bimanual examination, under anesthesia, of the uterus and tubes and ovaries. When the bimanual examination is finished, introduce the speculum and expose the cervix and catch it with a tenaculum-forceps.

2. If chronic endometritis or subinvolution is present, curet the uterus. When the cervix is to be repaired immediately after curettement, no gauze need be placed in the uterus.

3. Outline, by incision with the bistoury, the area to be denuded, leaving in the center of each lip a strip about a third of an inch wide, to form the new cervical canal (Fig. 342). The strip of tissue to be left should be wide enough

so that no stricture will result, after the healing and involution. Watch this point particularly, as some stenosis, requiring dilatation, sometimes follows trachelorrhaphy. It is a good plan to leave the strip a trifle wider at the external os, as indicated in Fig. 343.

The area of denudation should include all the scar-tissue, and should extend outward so as to give a wide surface of denudation for approximation.

4. Denude. A very good way is to first make an incision deep in the angle of each side (Fig. 344). This should extend through the scar-tissue into healthy tissue. Then catch the lower angle of the strip to be removed from one side of the lower lip and, while holding this with the tissue forceps, clip it loose with the scissors, straight or curved as preferred (Fig. 344). This process of cutting is continued all the way to the base of the flap. The upper part of the same side of

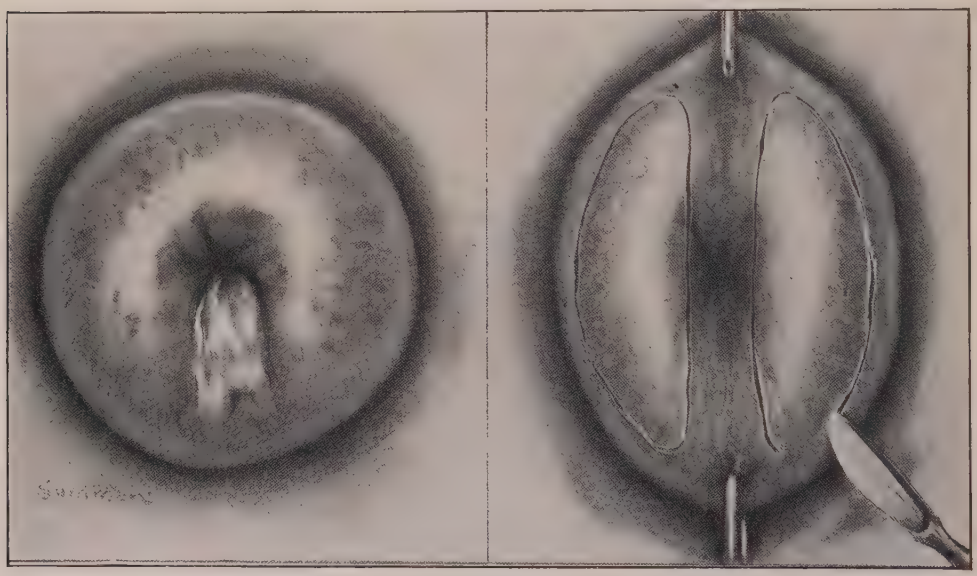


Fig. 342. Fig. 343.

Fig. 342. The lacerated and everted cervix, with discharge issuing from the canal. The rounded ball-shape, so frequently present in severe laceration, is here well shown.

Fig. 343. Repair of the Cervix Uteri. The site of the external os has been grasped with a tenaculum-forceps on each side, and the areas to be denuded are being outlined with a knife.

the cervix is treated the same way, and then the other side of the cervix (Fig. 345). Beginning below diminishes the inconvenience from the bleeding. Special care should be taken to remove all scar-tissue from the angles. Cysts in the area of denudation should be excised. If the surfaces are brought together with cysts in them, the operation is liable to do more harm than good, as the cysts may continue to develop in their buried situation and produce disturbance. If cystic areas cannot be readily excised so as to permit of good approximation for trachelorrhaphy, the areas of cystic degeneration should be removed by Schroeder's partial amputation, explained later. If the cysts extend very deeply into the

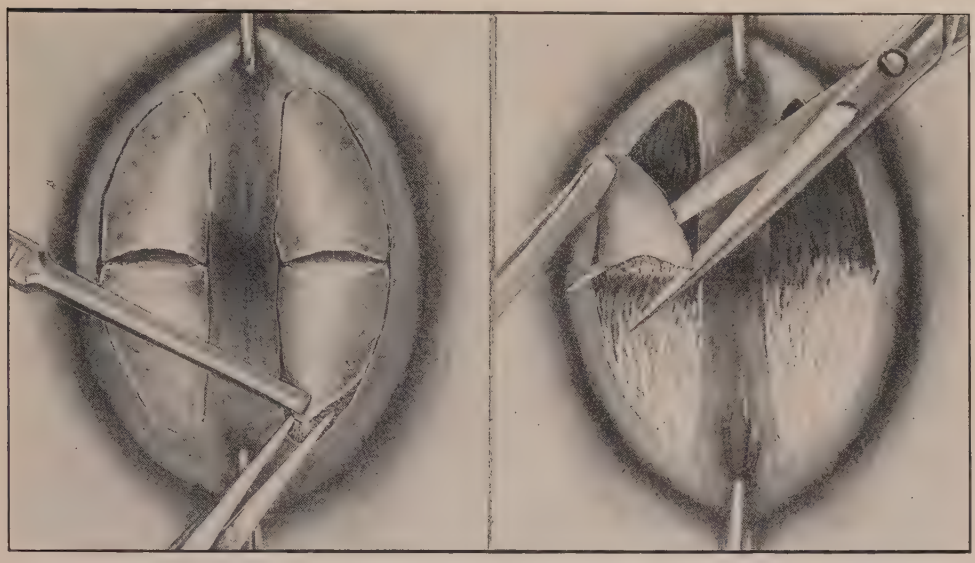


Fig. 344. Fig. 345.

Fig. 344. The areas have been outlined, an incision has been made across each side at the angle, and the denudation is being started at the lower portion of the left lip.

Fig. 345. The denudation has been almost completed. The last quarter of the tissue to be removed is being clipped away.

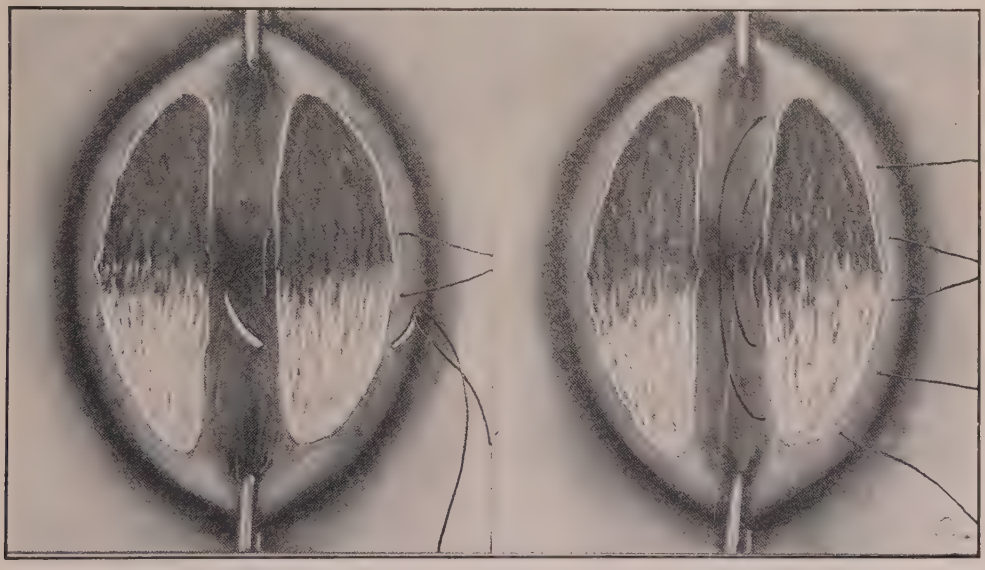


Fig. 346. Fig. 347.

Fig. 346. The first suture has been introduced at the angle on one side and the needle is in place for the second suture. Notice that the needle enters in the vaginal mucosa and emerges in the mucosa of the cervical canal. When a suture thus placed is tied, it accurately approximates the entire width of the denuded area.

Fig. 347. All the sutures on one side have been passed.

cervical wall, and particularly if there is marked hypertrophy or elongation of the cervix, the regular wedge-shaped amputation may be advisable.

For denuding, some prefer a knife, some straight scissors and some curved scissors. The "hawk-bill" scissors of Skene are very convenient for biting the scar-tissue out of the angles of the tear.

5. Introduce the sutures. After the denudation is complete, the cervix is cleansed with the antiseptic solution, and then the sutures are passed. The first suture is introduced at the upper angle of the wound, as shown in Fig. 346. As each suture is passed its ends are caught in a hemostatic-forceps and held out of the way. The next suture is passed about one-third of an inch (1 cm.) below the first, and so on down to the end, as many as are needed for that side (Fig. 347). The sutures on the other side are then passed in the same manner. When all the sutures are in place (Fig. 348) the cervix is cleansed with the antiseptic solution and all clots are carefully sponged away from the angles of

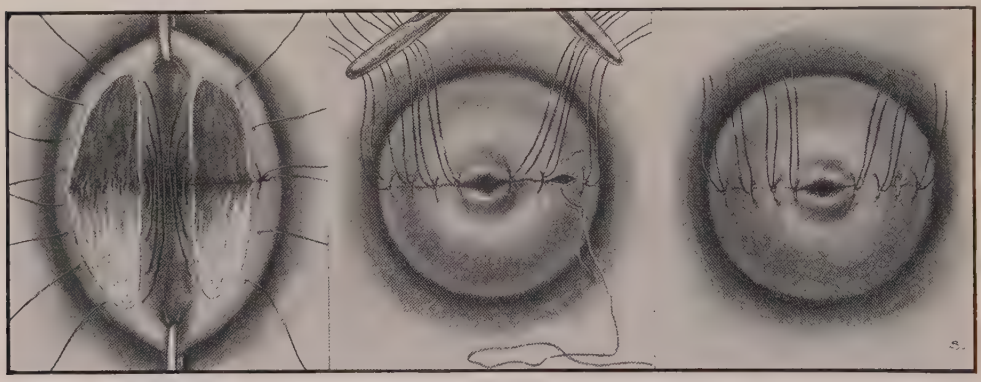


Fig. 348. Fig. 349. Fig. 350.

Fig. 348. All sutures are in place and ready for tying.

Fig. 349. The sutures tied. The wound is then inspected to see if any superficial approximation sutures are needed. Such a suture, of catgut, is being placed in the left side of the cervix.

Fig. 350. The operation completed. Notice that the ends of the silkworm-gut sutures have been left about an inch (2.5 cm.) long. When cut short they stick the vaginal wall like pieces of wire.

the tear. The sutures are then tied, beginning with the one first passed. All the sutures of one side are tied and then those on the other side. The line of approximation is then examined to see if any superficial sutures are needed. Frequently one or two superficial sutures will be needed to secure accurate approximation, as indicated on the left side in Fig. 349. The sutures, if of silkworm-gut, are then cut long—about an inch from the knots (Fig. 350). If the silkworm-gut ends are cut shorter they are likely to stick the vaginal wall and cause irritation.

If there is free bleeding from an angle as soon as the tissue is removed from it, the suture for that area may be passed and tied at once. As a rule this does

not interfere materially with the denudation and suturing on the other side, particularly if the more deeply lacerated side is the first attacked.

6. Replace the uterus. The uterus is necessarily pulled down a good deal during repair of the cervix and the fundus may have gone backward. After the cervix is repaired the speculum should be removed and the uterus replaced to its normal position by bimanual manipulation.

A strip of antiseptic gauze is then packed lightly into the vagina and the vulva is covered with a sterile dressing of cotton or gauze, held in place by a T-bandage.

In this operation, for keeping the field clear of blood, the author employs sponging with sponges held in long forceps, with occasional washing out with the hot bichloride solution. If preferred, continuous irrigation may be employed, with occasional sponging.

For suture material in the cervix, silkworm-gut is usually used, except when the pelvic floor is to be repaired at the same time. Then an absorbable suture is desirable, and chromicised catgut (40-day catgut) is satisfactory. No suture is advisable here that will not hold at least ten days in the mucosa. Even when the pelvic floor and cervix are repaired simultaneously, silkworm-gut may be used in the cervix. It is left in place four to six weeks. When the pelvic floor is firmly healed, the patient is placed in the Sims posture, the Sims speculum is carefully introduced to expose the cervix and the sutures are removed.

Recently the author has been using a kangaroo-tendon stay suture on each side, to supplement the forty-day catgut in the cervix, so as to avoid the non-absorbable silkworm-gut sutures. This is particularly desirable in the cases requiring also repair of the pelvic floor.

If trachelorrhaphy is carried out in the dorsal posture, there is no difficulty in tying the sutures. In the Sims posture there may be considerable difficulty, necessitating the use of perforated shot for fastening them. Silver wire is good suture material for the cervix, but it is no better than silkworm-gut and is decidedly more inconvenient to handle. Silk is poor suture material for the cervix for it soon becomes soaked with fluid and permeated by bacteria, and acts as an irritant in the tissues.

When there is a *stellate laceration* (Fig. 351), the expedient to be adopted depends on the situation and extent of the lacerations. If the principal laceration is bilateral, the other being slight and consequently of little importance, the latter may be disregarded. If the third laceration is deep and close to one of the lateral tears, the small intervening piece of tissue may be excised, as indicated by the dotted line in Fig. 352, and the laceration converted into a simple bilateral one, which is repaired in the usual way. When the third tear is deep and near the center of one of the lips (Fig. 351) it may be denuded and repaired first (Fig. 352), and then the lateral tears repaired as usual (Fig. 353).

Sometimes in a bilateral laceration there is a marked *disproportion between*

the lips, one lip being much longer than the other, making accurate approximation impossible by the usual method. When the difference is not marked it may be equalized by extending the angle of excision into the longer lip (Fig. 354). When the disproportion is marked, a wedge-shaped piece may be excised from the longer lip and the wound closed, and then the two lips approximated by the ordinary operation (Fig. 355). Another method is to trim down the large lip by cutting the end and sides and inner surface. That of course leaves no mucous lining for the new cervical canal. However, an extra width of lining for the new canal is left on the other lip and this prevents union of the surfaces where the canal should be. If the lips are greatly hypertrophied from cystic disease, partial amputation, as described below, is preferable to trachelorrhaphy.

After-treatment. The genitals should be kept covered with a large sterile dressing of cotton or gauze. Do not catheterize the patient unless there should be retention of urine.

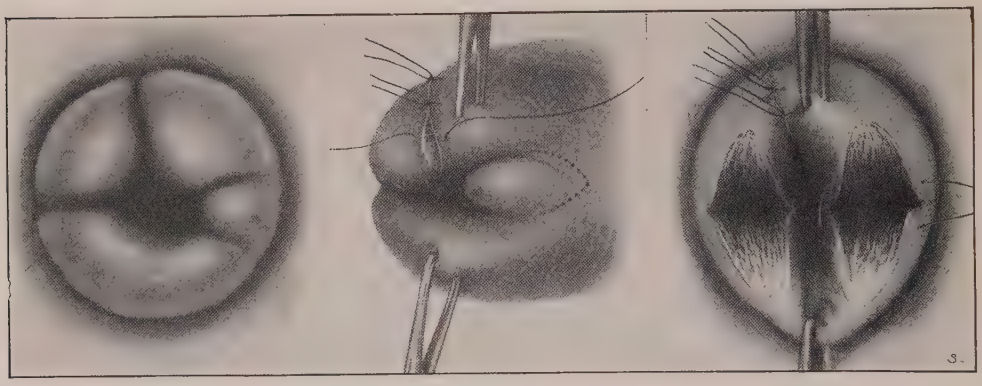


Fig. 351. Fig. 352. Fig. 353.

Fig. 351. A Stellate Laceration of the Cervix. The multiple lacerations of the cervix present some nice problems in denudation and approximation.

Fig. 352. Showing two expedients which are useful in the handling of irregular lacerations of the cervix. A laceration near the center of the anterior lip is being repaired. The two lacerations close together at the left side of the cervix are to be joined by excision of the intervening tissue, as indicated by the dotted lines.

Fig. 353. The irregular conditions have been taken care of and the cervix is now ready for the regular repair.

A bowel movement should be secured the second or third day, and daily after that. The gauze packing may be left in two days. It is then removed, and thereafter a hot antiseptic douche is given once or twice daily, depending on the amount of discharge.

After the first week, the patient may be allowed to get up and walk about, as rest in bed after the first few days is not necessary for the healing of the cervix. In many cases, however, it is best to keep the patient in bed two or three weeks on account of associated diseases. In "run-down," nervous and worn-out women, this combination of the rest-cure with the operation is of great benefit and in

some of them the rest in bed with good nourishment and relief from care, probably contributes as much as the cervical repair to the improvement attained.

The sutures are removed in two weeks. The most convenient way to remove the sutures is to place the patient in the Sims posture, introduce the Sims

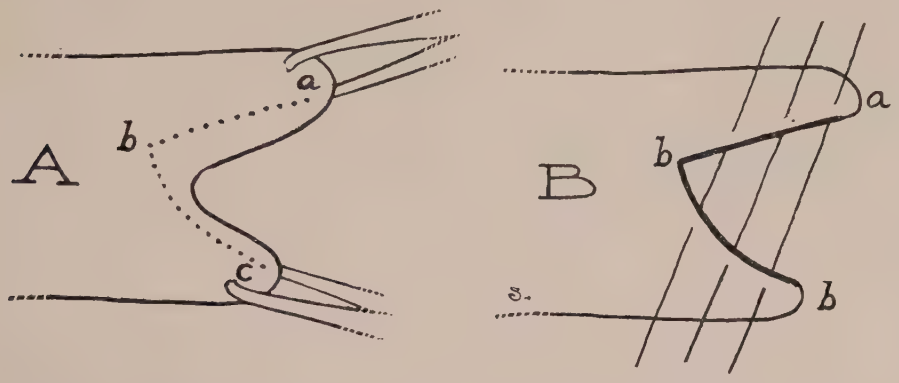


Fig. 354. Another Irregular Condition that causes difficulty in repair of the cervix. One lip is much longer than the other.

A. The length of the two lips may be equalized for approximation by extending the area of denudation somewhat over onto the longer lip, as indicated in the denudation outline *abc*.

B. The sutures placed for approximation of the denuded lips. Notice that the sutures are so placed that when tied they will draw the shorter lip forward, making it almost as long as the other one.

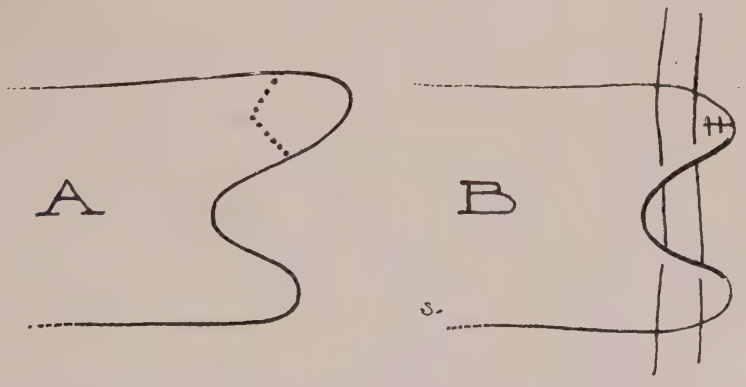


Fig. 355. Another Method of taking care of marked disproportion in the length of the lips of the torn cervix. If the disproportion is so marked that it cannot be overcome by the simple variation in denudation shown in Fig. 345, the end of the longer lip may be excised.

A. The portion of the long lip to be excised is indicated by the dotted lines.

B. The excision and suturing of the longer lip has been completed, and the sutures have been passed for regular repair of the cervix.

speculum, expose the cervix, catch an end of a suture with forceps, pull it down until the knot comes into view or can be felt with the point of the scissors, and then cut the loop. When it is supposed that the sutures are all out, remove the speculum, place the patient in the dorsal posture and make a digital examination

to see if all the sutures are really out. A suture missed by inspection is easily felt in the digital palpation.

Sexual intercourse should be postponed till six weeks after the sutures are removed.

Failure to secure the desired result from the operation may be due to:

1. Want of necessary preparatory treatment.

2. Infection, which of course spoils the operation and may lead to serious periuterine inflammation.

3. Insufficient removal of the scar-tissue in the angles, or the leaving of cysts somewhere in the area of denudation.

4. Too much encroachment upon the area left for the cervical canal, causing subsequent stenosis with retention of contents and dilatation above the constricted area.

5. An incomplete diagnosis. Trachelorrhaphy will not relieve the symptoms of lacerated pelvic floor, prolapsus uteri, adherent retroversion, chronic salpingitis, or the various other diseases that may exist in the pelvis. To operate for a lacerated cervix without a thorough examination and diagnosis, as is done in some cases, is to invite failure and disappointment.

The physician is often asked if the cervix will not tear again at the next labor. It may and it may not. Very frequently it does not tear to any considerable extent. A cervix which has been repaired is less of a menace to the patient in labor that a cervix which is the seat of chronic inflammation and cystic disease.

REGULAR AMPUTATION OF THE CERVIX.

The regular wedge-shaped amputation, removing an entire cross-section of the cervix, is occasionally required for marked elongation or hypertrophy. It is quite distinct from the partial amputation or resection of the diseased cystic area, described later.

Technique.

The elongated cervix is first split as far up as it is desired to amputate, as shown in Fig. 356. Then each half is removed by two incisions. One incision is made from the vaginal surface and the other from within the cervix, as indicated by the two knives in Fig. 356. The two incisions for each lip are directed backward and meet in the cervical tissue in the form of a wedge, as shown by the dotted lines in Fig. 359,A. Care should be taken to remove only the excess of cervix, and the line of amputation should be at least half an inch below the internal os.

The required amount of tissue having been removed, the wedge-shaped wounds are closed by sutures introduced as in Fig. 357 and in Fig. 359,B. The

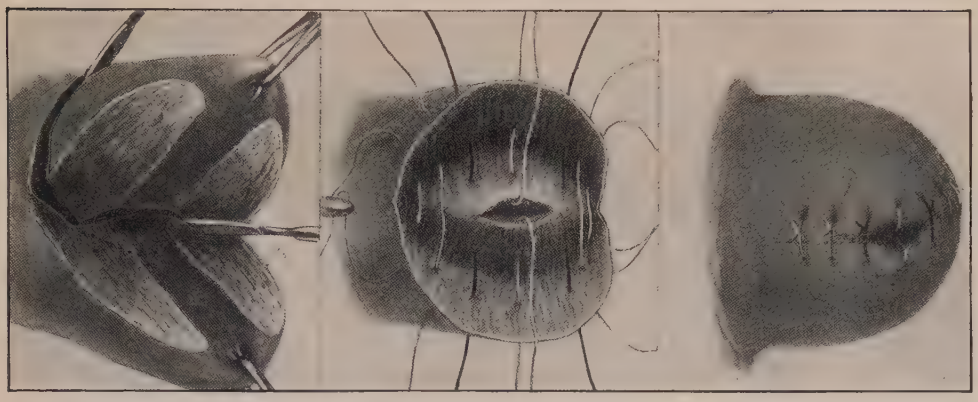


Fig. 356. Fig. 357. Fig. 358.

Fig. 356. Regular Amputation of the Cervix. The cervix has been split up as far as required, and the method of excising the wedge of redundant tissue is indicated. The upper knife is in place for making the external incision and the lower knife indicates the method of making the internal incision. The lower lip is to be excised by the same kind of incision from without and from within.

Fig. 357. The sutures in place ready for tying. The sutures may be all of silkworm-gut or principally of catgut with a suture or two on each side of silkworm-gut (as here shown) or they may be all of catgut. If catgut is used exclusively, it must be well chromicised (40-day catgut).

Fig. 358. The operation completed. It is preferable to leave the ends of the silkworm-gut sutures about an inch (2.5 cm.) long, instead of cut short as shown in the illustration.

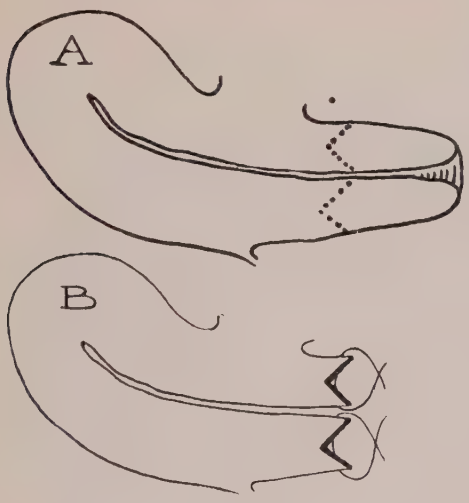


Fig. 359.

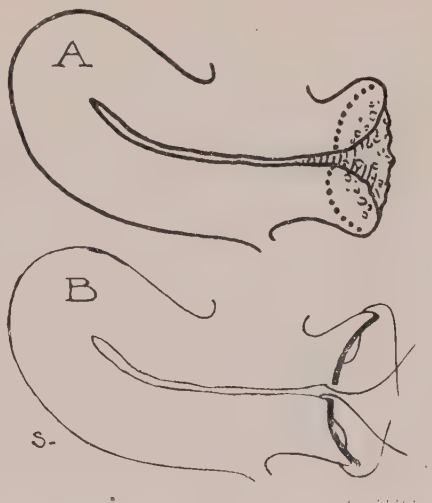


Fig. 360.

Fig. 359. Regular amputation of the cervix, shown diagrammatically.

A. The location and direction of the lines of incision are indicated by the dotted lines.

B. The redundant portions have been excised, and the sutures are in place for closing.

Fig. 360. Amputation of the cystic area of the cervix.

A. The cystic area to be excised is here shown, and the lines of incision are indicated by the dotted lines.

B. The cystic area has been excised and the sutures for closing are in place. Notice that the sutures of each side are so placed that when tied they approximate the outer portion of the raw area over the inner portion, thus covering all raw surfaces.

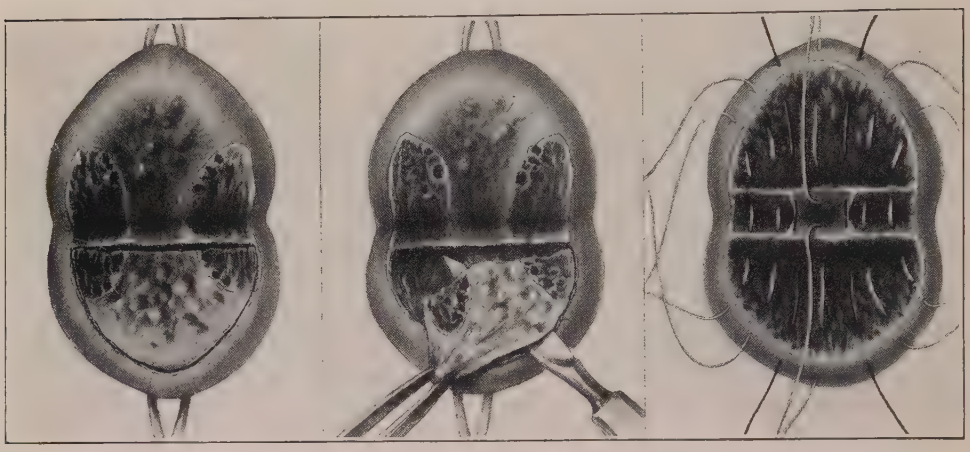


Fig. 361. Fig. 362. Fig. 363.

Fig. 361. Beginning the excision of the cystic area of the cervix. The cervix has been split to above the cystic area, and the area to be excised from the anterior lip has been outlined by a superficial incision.

Fig. 362. Showing the method of excision. The cystic area has been removed from the anterior lip, and the corresponding portion of the posterior lip is in process of removal.

Fig. 363. The excision has been completed and the sutures are in place ready for closing. In this illustration the sutures are of catgut with a reënforcing suture of silkworm-gut on each side.

sutures may be all silkworm-gut or all 40-day catgut, as preferred. If catgut, chromicised less than the 40-day variety, is used, there should be at least one silkworm-gut suture on each side, as indicated in Fig. 357. The central sutures are tied first and then the lateral ones. If accurate approximation (Fig. 358) is not secured, the edges may be further approximated by superficial catgut sutures.

PARTIAL AMPUTATION OF THE CERVIX.

This is referred to also as "resection of the cervix," "excision of the cystic area," and the "Schroeder operation."

When many small cysts have formed in the everted and infiltrated surfaces of the cervix, as shown in Fig. 361, excision of the cystic area is preferable to regular trachelorrhaphy. Of course, when there are only a few cysts, they may be removed in the regular denudation for repair, but when the "cystic degeneration" is extensive, removal of the whole cystic area is advisable.

Technique.

The line of excision must encompass the cystic area, as indicated by the dotted line in Fig. 360,A. The vaginal surface is grasped with a tenaculum-forceps and the diseased cervix split, as shown in Fig. 361. An incision is then made all around the portion to be removed from one lip, thus outlining the area as shown by the faint incision line about the cystic area on the upper lip in Fig.

361. This area is then removed completely, the excision going deeply enough to remove all cysts. The lower lip is treated in the same way (Fig. 362). The sutures are introduced as shown in Fig. 360,B and in Fig. 363. The sutures are then tied, completing the operation. It is well to introduce a stem pessary and

Fig. 364. Fig. 365. Fig. 366.

Fig. 364. Conical Excision of the Cervix. The cystic area grasped and excision begun.
Fig. 365. Continuing the conical excision of the cystic area.
Fig. 366. The cone of cystic tissue excised.

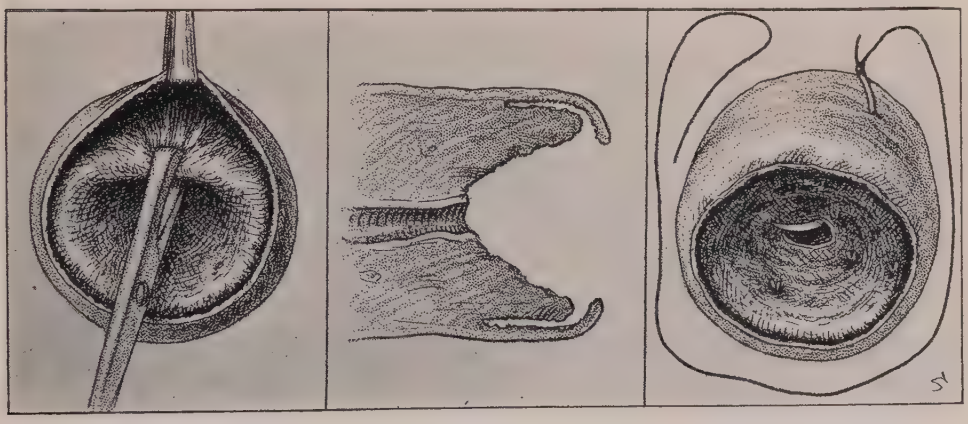


Fig. 367. Fig. 368. Fig. 369.

Fig. 367. Forming the anterior flap of mucosa.
Fig. 368. Sectional view, showing both flaps formed.
Fig. 369. Passing the anterior main suture of silkworm-gut or kangaroo tendon.

leave it in during the healing process to maintain a good sized opening. The after-treatment is the same as for regular repair of the cervix.

This is a very satisfactory operation. It removes the diseased portion of the cervix, reduces the enlargement and leaves no raw surface exposed.

A variation in technique devised by Sturmdorf (Gynoplastic Technology) and designated "conical excision" of the cervix is shown in Figs. 364 to 375. After excision of the cone of diseased mucosa (Figs. 364 to 366) the vaginal mucosa is loosened from the outer surface of the cervix (Figs. 367, 368) and made to slide inward over the raw surface remaining from the removal of

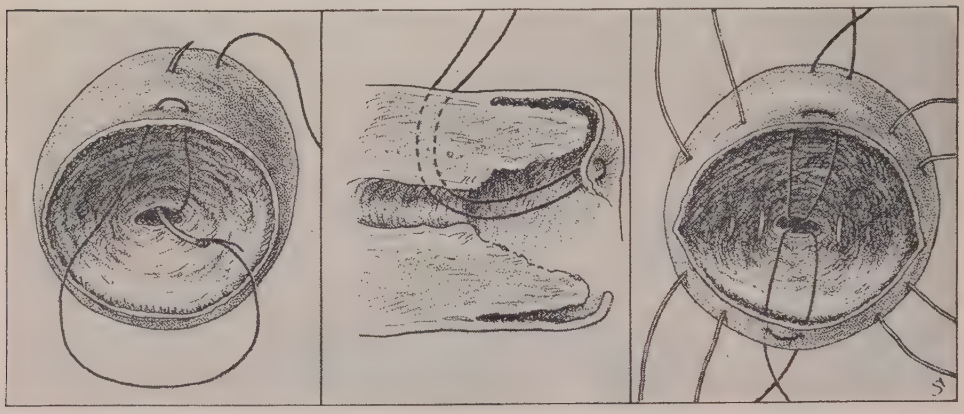


Fig. 370. Fig. 371. Fig. 372.

Fig. 370. The anterior main suture continued. It is passed from the vaginal surface through the wall of the cervix, out at the canal opening, up to take a bite of the margin of the anterior flap, then back to the canal and out through the wall and vaginal surface.

Fig. 371. Sectional view showing the course of the anterior main suture. This suture is not tied until the others are placed.

Fig. 372. Both the anterior and posterior main sutures placed and also the secondary lateral sutures for securing approximation and hemostasis.

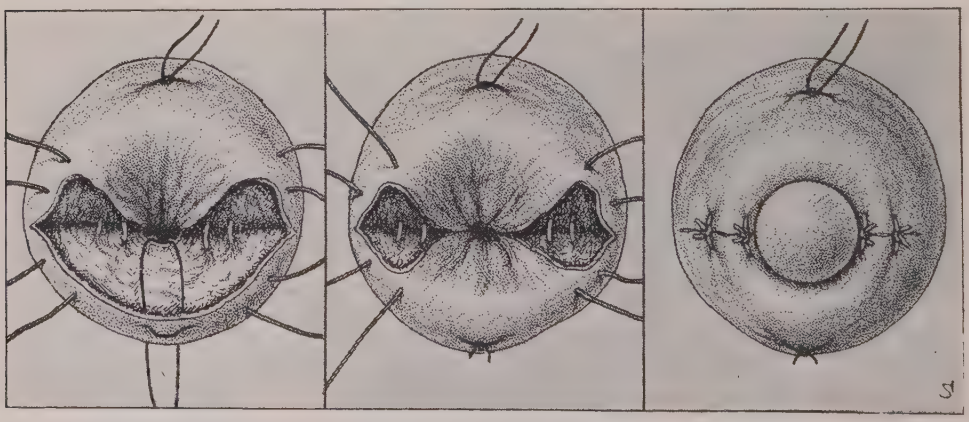


Fig. 373. Fig. 374. Fig. 375.

Fig. 373. The anterior main suture tied, drawing in the anterior flap.

Fig. 374. Both main sutures tied. If these sutures are of kangaroo-tendon, they may be cut short, but if of silkworm-gut, they must be cut an inch or more long.

Fig. 375. All sutures tied and the cervical stem in place. The stem is of the type shown in Fig. 776-*f*, and is used to guard against stenosis of the cervix at the area of union.

the cystic area. The sliding of the undermined mucosa inward to the internal os is accomplished by an ingenious suture, one for each lip. The anterior suture catches the edge of the loosened mucosal flap as shown in Figs. 369 to 371. The suture is then tied at the vaginal vault, the central loop drawing the anterior mucosal flap to the internal os (Figs. 369, 370). A similar suture through the posterior lip draws the posterior mucosal flap into place (Fig. 374).

In all operations on the cervix it is important to avoid drawing the cervix so low as to stretch the broad and utero-sacral ligaments. The lower the cervix, the easier the work, but the work should not be made easy at the expense of important supporting structures. Consequently, long instruments, short needles and proper retractors should be provided for work in the depth of the vagina, and the assistant holding the cervix should watch closely that no unnecessary traction is made.

CURETTAGE OF CORPUS UTERI.

In curettage, the mucosa lining the body of the uterus is scraped away with a sharp curet. The soft mucosa is removed down to firm resisting tissue. The ends of the uterine glands, which extend into the firm tissue, escape removal and it is from these gland-remnants that the curetted interior becomes covered with epithelium again in a short time.

Indications.

Curettage is employed for diagnosis and for treatment.

For Diagnosis. As a diagnostic measure, curettage is employed to determine the cause of persistent discharge from the interior of the uterus. Specifically, the problem is usually to determine whether or not there is malignant disease within the uterus. The discharge may be bloody or simply muco-purulent. In either case it indicates some lesion, the nature of which should be determined within a reasonable time. It is at this point that there have been many failures. The term "many failures" is used advisedly, for of the hundreds of women who annually die of cancer of the uterus, a large number undoubtedly go to physicians in the early stage and are treated for chronic endometritis, "change of life," etc. Physicians seem slow to comprehend the fact that an unusual discharge, whether leucorrhœal or bloody, in the menopause period, means pathological change just as much as at any other period. The change may be simply inflammatory or nutritive. But, on the other hand, it may be beginning malignant disease, and the physician must not rest until he has excluded malignant disease with reasonable certainty.

In order to **exclude malignant disease,** it is not necessary to curet every patient who comes with a leucorrhœa or bloody discharge. By study and care, the differential diagnosis may be made otherwise in many cases, and the indications for diagnostic curettement held within reasonable limits. As in the case of possible malignant disease of the vaginal portion of the cervix, the differ-

ential diagnosis is so important that the author gives it here in detail, even at the risk of repetition.

Differential diagnosis. Taking up the differential diagnosis in diseases causing uterine discharge; we know that malignant disease is always chronic. So we can eliminate at once all acute diseases, leaving only the following: chronic endocervicitis (septic, gonorrhœal, and glandular), chronic endometritis (simple, septic, gonorrhœal and tubercular), polypi and fibromyomata. Endometritis is used here as a blanket term to include nutritive disturbances as well as inflammatory.

In differentiating these affections from malignant trouble the effect of treatment is an important item. Inflammation of the uterus in any form is greatly benefited by appropriate treatment. Consequently every case of uterine disease presenting induration, ulceration, or discharge, should be subjected to careful and vigorous treatment for the purpose of differential diagnosis as well as for the purpose of effecting a cure.

Chronic endocervicitis. In suspected chronic endocervicitis, a very good plan is to give a hot antiseptic douche two or three times daily, and every second or third day apply a four per cent silver nitrate solution, or tincture of iodine, to the cervical canal. If there is a marked congestion of the cervix, make multiple punctures. If the external os is so small as to interfere with drainage, open it by dilatation or incision. If there are cysts, puncture and evacuate them and touch the cavities with silver nitrate or tincture of iodine or carbolic acid. If there are polypi, remove them. If the cervix is hypertrophied and riddled with cysts, excise most of the diseased area and repair the cervix or partially amputate it.

Any tissue removed from the cervix, either curettings or polypi or pieces removed in denudation for repair, should be subjected to a microscopic examination in every case that is the least suspicious. The simple fact that cystic disease is present does not exclude cancer. Both may be present, and if the pathological discharge persists after a course of treatment, a piece should be excised from the suspicious area.

Chronic endometritis. Simple endometritis—that is, where there is no pus infection—is due usually to poor blood or a malposition or a stenosis or subinvolution or a tumor. Remove the cause and, if the changes in the endometrium are not marked, they will subside spontaneously or after a few astringent applications. If the pathological changes are marked, it is not sufficient to remove the cause, but we must remove also the diseased endometrium, that a new and better one may develop under the bettered conditions. If the case is not perfectly plain, the scrapings should be examined microscopically, that the diagnosis may be confirmed or disproved.

In chronic septic endometritis and in chronic gonorrhœal endometritis, the idea of effecting a cure by long-continued intrauterine applications, repeated week after week and month after month, is a delusion and a snare. These long-

continued applications rarely if ever effect a cure, they frequently cause extension of the inflammation to the tubes, and worse still, they deceive the patient and the physician with the thought that something is being done towards a cure—whereas, little or no real progress is made against inflammation, and if malignant disease be present it is allowed to develop till it is past cure.

In all these cases in which the trouble persists after a course of treatment including a few intrauterine applications, the uterus should be carefully cleared out with a curet. Then if the trouble is only inflammation, the patient is in a fair way to get well, and if the microscopic examination of the scrapings shows malignant disease, the uterus can be removed in this early stage with a well-founded hope of saving the patient's life.

Fibromyomata are frequently multiple, and when only a single tumor can be felt it may be of such large size or have existed so long with but little disturbance, that malignancy is excluded. But there are many cases in which the mass is small and as far as known has existed only a short time. In these cases the most important point in the differential diagnosis is the change that takes place in the endometrium in the two diseases.

A fibromyoma frequently causes a chronic hypertrophic endometritis which gives rise to discharge and hemorrhage.

A malignant tumor starting deep in the uterine wall may at first cause similar changes, but in the course of time and before it reaches a large size or passes beyond the limit of complete removal, it extends to the endometrium, and characteristic elements will be found in the uterine scrapings. Furthermore, the great majority of malignant growths of the body of the uterus *begin* in the endometrium and so produce characteristic changes there in the very earliest stage.

Therefore, in a case of small tumor of doubtful character, accompanied with discharge or bleeding, curettement is advisable as a means of diagnosis. If the uterine scrapings do not show malignant infiltration we are justified in assuming that the tumor is a fibroid, but if the scrapings do show malignant infiltration the radical operation is, of course, indicated at once.

Another point which should be kept in mind is that a malignant tumor which at first causes disturbance of the endometrium by pressure or proximity only, may later send its characteristic elements to the endometrium where they can be reached with the curet. Consequently, when the first examination shows nothing malignant, if signs of marked endometrial disturbance again appear, the diseased tissue should again be removed for examination.

In the later stages also of uterine tumors, curettement is valuable as a diagnostic means. For instance, a patient presents a large tumor of the uterus of doubtful character, with pain and discharge and marked disturbance of the general health. Curettement will lessen the hemorrhage and discharge temporarily and will furnish tissue for examination. If the scrapings show no malignant infiltration, the tumor is probably fibroid and removal may be indicated. If the

scrapings do show malignant trouble, only palliative measures are indicated, as the growth has advanced too far for complete removal.

For Treatment. For therapeutic purposes curettage is employed for persistent leucorrhœal discharge and for persistent bloody discharge. Where the disease is situated mainly in the endometrium, curettage usually produces a marked improvement. It is employed also for the removal of placental remnants and of polypoid growths.

Technique.

The preparations for curettage and the instruments required are given under vaginal operations (Chapter XVII).

After the patient is anesthetized, and the regular cleansing completed, the speculum or retractor is introduced and the cervix and vaginal vault carefully cleansed. The curettage is then carried out by the following steps:

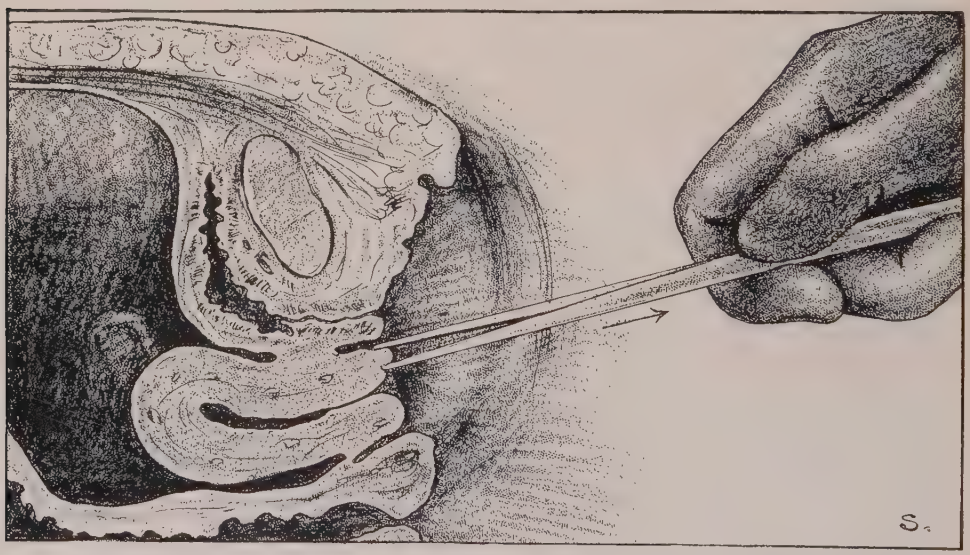


Fig. 376. An Error in the technique of curettage. To make the simple operation easier, the cervix has been dragged to the vaginal outlet, thus stretching the uterine supports and predisposing to subsequent retrodisplacement and prolapse.

1. Holding the cervix. The cervix is caught with a tenaculum-forceps and held by an assistant while the operative work is being carried out. An important point here is to avoid pulling the cervix down to the vaginal outlet. The utero-sacral ligaments and the broad ligaments may very easily be overstretched. When thus lengthened, they remain lax, causing the cervix to come low and predisposing to retrodisplacement and subsequent prolapse. The ligaments are easily stretched, but it may require a serious operation to restore their supporting power. In a certain proportion of patients who come for operation for

retrodisplacement, the history indicates very definitely that the troublesome displacement followed a curettement. Thus a serious condition may result from a simple curettage, because to make the simple operation easier, the cervix was carelessly dragged to the vaginal outlet, as indicated in Fig. 376.

To avoid this unnecessary downward traction, which is made involuntarily unless the holding hand is at rest, the hand should rest firmly on the pubes, as shown in Fig. 377. With the hand thus at rest on a firm surface, the cervix may be fixed with a tenaculum-forceps at any point and held there securely without undue downward traction. Unless the ligaments are already lax from dis-

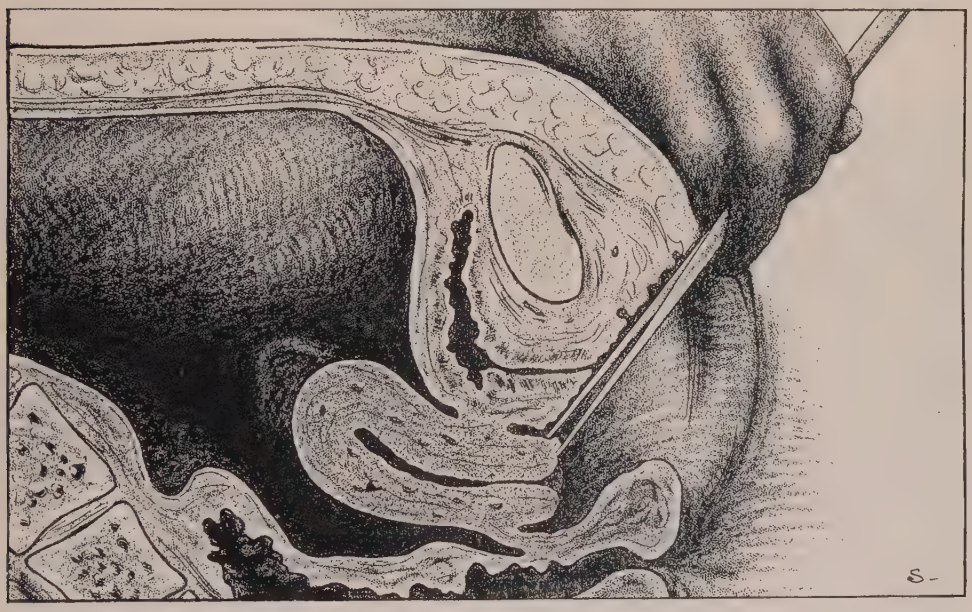


Fig. 377. The safe method of securing the necessary fixation of the cervix, for Dilatation and Curettage. The hand rests firmly on the pubes and, by means of the securely held tenaculum-forceps, fixes the cervix at any desired point in the vagina. Elevation of the cervix, to bring the canal parallel with the vagina, aids materially in the manipulations and does not produce overstretching of the broad and utero-sacral ligaments, as does dragging of the cervix to the vaginal outlet. Special care in this respect is necessary when curettage is carried out after forward fastening of the corpus uteri.

placement, the uterus should not be brought closer to the vaginal entrance than indicated in Fig. 377.

2. Dilatation. The external os is dilated somewhat with the uterine dressing forceps and the cervical canal swabbed with an antiseptic solution, tincture of iodine being a very good one. If there is a large amount of tenacious mucus, its removal is facilitated by a strong solution of sodium bicarbonate or other alkali. Now is the time to sound the uterus, if that is desired, to determine its depth and direction. The sound, or any other instrument with a small point, must be used very carefully because of the danger of perforation of the uterine wall.

The curved dressing forceps is then introduced past the internal os and the whole canal dilated as far as possible with that instrument or with a small dilator if such is at hand.

As soon as the canal is sufficiently dilated, the large dilator is introduced (Fig. 378) and the dilatation completed. A dilatation of one-half to three-quarters of an inch (1½ to 2 cm.) is usually sufficient, though it may be made considerably wider if desired. The dilatation should be made slowly and in various directions, the dilator being held open for a period of a minute or two at a time to give the cervical tissues a chance to stretch gradually. In most cases it requires considerable force to dilate the cervix. Occasionally, as this force is being applied, the cervical tissue will suddenly give way, permitting the dilator blades to open widely and tear through the cervical wall into the para-

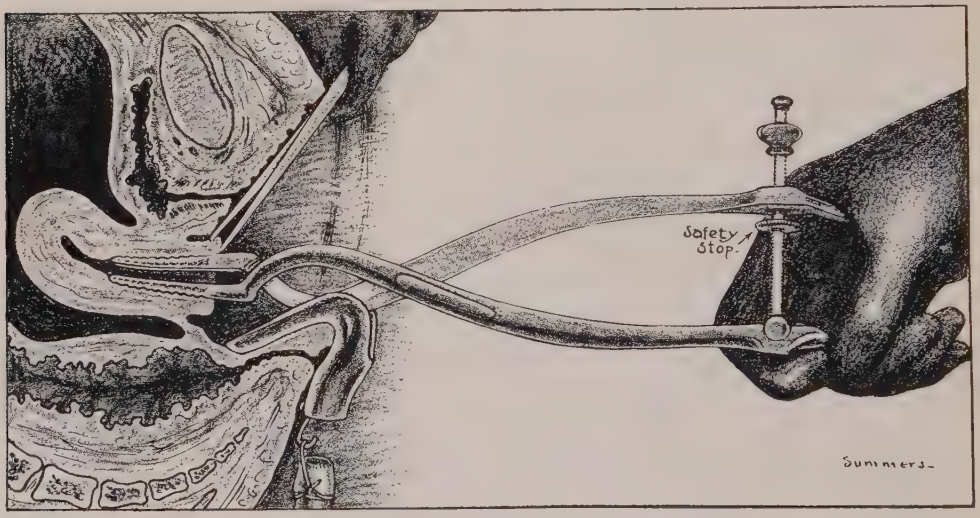


Fig. 378. Dilating the cervix. After preliminary dilatation with curved dressing forceps or pressure forceps, the large dilator is introduced and the cervix dilated in different directions. There are two special points to be kept in mind. First, the dilator-blades are to be introduced well past the internal os, a maneuver not always easy of execution. Second, the set-screw on the cross-bar at the handle is to be used as a safety-stop and should be kept only a short distance ahead of the blade, for the reason explained in the text.

metrium. To prevent this accident, a safety stop is placed on most large dilators, as shown in Fig. 378. This may be screwed up and down on the cross rod, and it should be kept just a short distance ahead of the handle as the dilatation proceeds. By using this, all chance of extensive injury to the cervix, as above mentioned, is eliminated.

3. Curetting. By means of the sharp curet, all the soft mucosa is removed. The large or medium curet is preferable to the small, as the wider cutting surface removes the mucosa more evenly and with fewer strokes. The whole interior surface and lateral angles and cornua with one curet, and then the posterior surface and top of the fundus with the other curet.

A curet with a flexible stem, one that can be moulded to any desired curve for accurately curetting the various surfaces, is the only kind that will be found entirely satisfactory. The curet should be adjusted to the uterus and not the uterus to the curet. More accurate removal of the mucosa is attained in that way and with less violence to the uterus. When the uterus is in normal position the curet needs to be bent forward (Fig. 379) for curetting the anterior surface and backward (Figs. 380 and 381) for curetting the posterior surface. Repeated bending, forward and backward, causes the shaft to break after a time, so it is well to keep one curved forward, for the anterior surface and one curved backward, for the posterior surface. For each surface the curve may need to be

Fig. 379. Sharp curets for removing the diseased mucosa from the interior of the corpus uteri. The flexible shaft is to be bent as required to enable accurate approximation of the cutting edge to the surface to be curetted. The curets here shown are shaped for curetting the anterior wall of the uterine cavity.

A. Slightly bent.

B. Sharply bent, as required when there is a decided angle at the internal os.

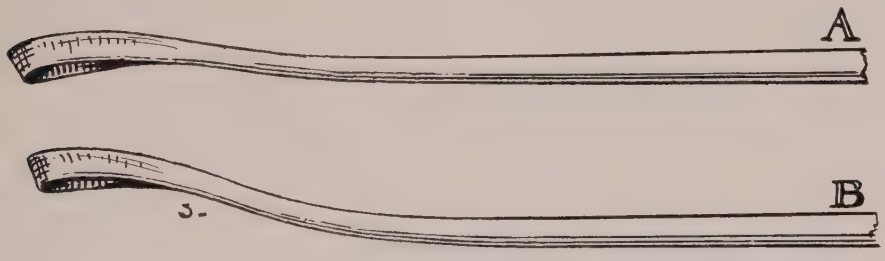


Fig. 380. *A*. and *B*. Curets bent backward at various degrees, for curetting the posterior surface of the uterine cavity, as shown in Fig. 363.

slight or marked, as indicated in Figs. 379, 380 and 381—the adjustment being made for each case at the time.

For effective curetting, the curet should be held with the sensitive portion of the fingers so that any irregularity in the uterus may be appreciated. The most satisfactory way is to hold it like a pen, as shown in Fig. 381. Very little force should be used, as the curet may easily be pushed through the uterine wall. For the effectiveness of the curetting, reliance should be placed upon accuracy of adaptation of the cutting surface to the wall, rather than upon force. When

firm underlying tissue is reached, the fact is indicated by the grating sensation imparted to the curet.

4. Removing débris. The débris may be quickly removed from the interior of the uterus by repeated swabbing with small pledgets of dry cotton held in the uterine dressing forceps. The dry cotton is introduced into the cavity, rotated and withdrawn. It picks up all loose débris and also brushes off pieces hanging to the wall.

If preferred, irrigation may be employed to remove the débris, but it is more troublesome and less effective and must be followed by more or less swabbing anyway.

After the cavity is sufficiently clean, introduce the uterine dressing forceps, open it widely, rotate and then close and withdraw it. This maneuver will catch any mass of tissue hanging from the wall or lying loose in the cavity, and on more than one occasion it has saved the author from subsequent embarrass-

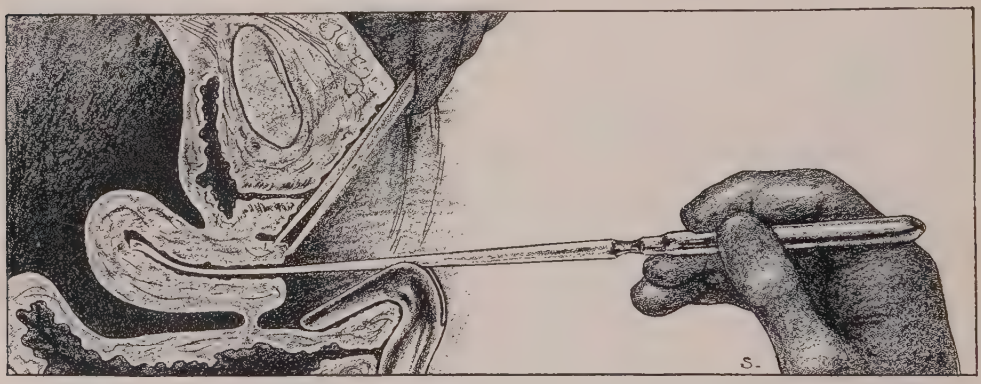


Fig. 381. Showing the most satisfactory way of holding the curet. Grasped thus with the sensitive portions of the fingers and thumb like a pen, irregularities within the uterus may be easily appreciated and also the force used may be more delicately adjusted than when the curet is grasped with the whole hand as is the custom with some operators. In some cases a little unusual pressure will force the curet through the uterine wall into the peritoneal cavity. This accident has happened a number of times.

ment. A polyp, hanging in the cavity, may be missed by the curet, and, being firmly attached to the wall by a pedicle, is not removed by swabbing or irrigation. Again, a loose mass of tissue may roll around in the cavity and remain there in spite of swabbing or irrigation. In either case the floating mass will be caught and removed by the above maneuver with the dressing forceps.

5. Application in cavity. If there is any suspicion of malignant disease, the lymph spaces of the curetted surface should be sealed by an application of carbolic acid or tincture of iodine, or, if preferred, a combination of the two (iodized phenol). The application tends also to check bleeding and to disinfect the cavity and is beneficial in any case.

Gauze packing in the cavity may or may not be used, as preferred. If there is no constriction of the cervix and no persistent bleeding, there is no particular

reason for leaving gauze in the cavity. If the case is one in which there is dilatation of the cervix for obstructive dysmenorrhœa, it is well to pack the cervical canal firmly and leave the packing in place for two days, to make the dilatation more lasting. If the obstructive dysmenorrhœa is the important feature of the case, it is preferable to maintain the dilatation for some weeks by sewing a stem pessary in the cervix as explained in Chapter XIV. In any case in which

Fig. 382. Restoring the uterus to its normal position after curettage. This important step is sometimes overlooked.

free bleeding persists in spite of the carbolic application, the uterine cavity may be packed firmly with gauze. The hemostatic effect is more marked if the end of the gauze strip is moistened with adrenalin solution.

6. Replacing the uterus. Even with every care, the cervix is necessarily drawn downward to some extent and the corpus accordingly displaced back-

ward. At the close of the operation, the corpus uteri should be brought well forward and the cervix pushed back. If it is desired to put a one-piece packing in the uterus and vagina, the intrauterine portion is put in place and the remainder held in the hand as the fingers are introduced for replacing the uterus, as shown in Fig. 382.

7. After-care. This is the same as after vaginal operations in general and is given in Chapter XVII. One particular point is, that in removing gauze from the uterus, the cervix should be held well back in the pelvis, as shown in Fig. 383. Otherwise the traction on the the gauze may lead to retrodisplacement.

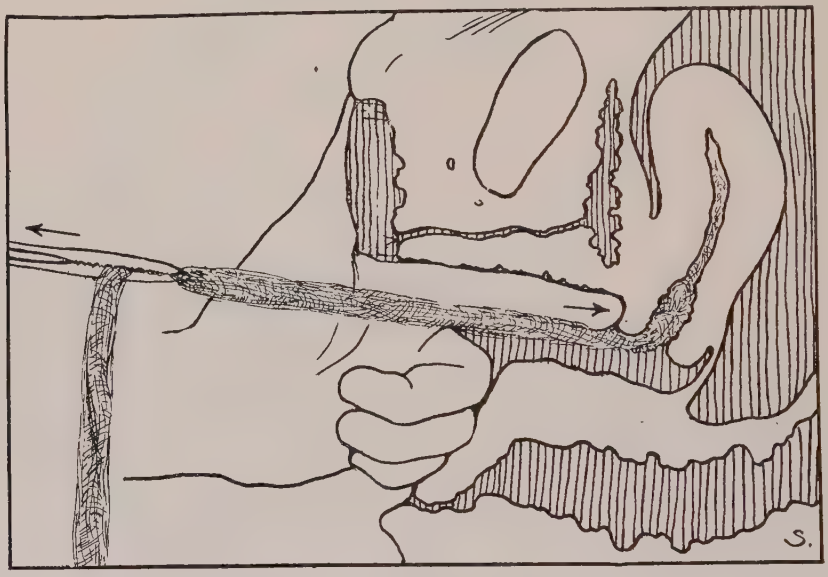


Fig. 383. An important point in the after-treatment following curettage. When packing is being removed from the cervix, the cervix should be held well back in the pelvis by the finger as here indicated. Otherwise the cervix will be drawn forward and the corpus uteri thrown backward into retrodisplacement. The hand is gloved.

HYSTEROTOMY.

Hysterotomy (incision into the uterus) is required for exploration in those rare cases of serious disease in which the preferable treatment cannot be otherwise determined. It may be vaginal or abdominal.

Vaginal hysterotomy. In vaginal hysterotomy, an incision is made in the anterior vaginal vault, the bladder separated from the uterus and the cervix split up the anterior surface to above the internal os. The sides of the uterine wound are caught near the internal os and drawn down. The cavity of the corpus uteri may then be explored with the finger, or it may be inspected if the light is good and the walls are well separated. Fibroid polypi in the interior of the uterus or nodules in the anterior wall may be removed and the wound closed.

Abdominal hysterotomy. In abdominal hysterotomy, the uterus is opened into by an incision from its peritoneal surface. In very exceptional cases, this

is advisable, to determine whether or not there is a pediculated or submucous fibroid requiring removal. In other cases it may be used to determine definitely the number and location of fibroid nodules, with a view to preserving the uterus if practicable.

Infective discharge within the uterus should, of course, be excluded before opening the uterus from the peritoneal surface. In any case, hysterotomy carries some danger and should not be resorted to without definite indications to justify the risk.

Ordinarily the incision should be in the median line, to minimize the bleeding. After the exploration, the incision is closed by a row of deep sutures approximating most of the muscular wall, and a row of superficial sutures, inverting and approximating the peritoneal margins of the wound.

RESECTION OF THE UTERUS.

Removal of the upper portion of the uterus or of some other portion, preserving the remainder, is employed principally for fibromyomata. Consequently the technique is considered in Chapter VI. Excision of a wedge including a considerable portion of the fundus and corpus, has been employed with benefit for persistent bleeding, from chronic inflammatory or nutritive disturbance of the uterine wall, and even for excessive menstruation. Caution, however, should be exercised in employing such a serious procedure, particularly as it accomplishes only partial removal of the diseased tissue.

HYSTERECTOMY.

Hysterectomy, for other than malignant disease, is employed principally for myomata, hence, the technique for both abdominal and vaginal hysterectomy is given in Chapter VI. Hysterectomy is indicated in inflammatory or nutritive diseases (chronic metritis, general fibrosis, cirrhosis, myopathica hemorrhagica, irritable uterus, etc.) when there is serious hemorrhage or discharge or uterine tenderness that does not yield to curettage and other minor measures.

RADIUM TREATMENT

Radium treatment is effective in nutritive diseases of the uterus in which hemorrhage is the principal symptom. Malignant disease must be excluded by curettage. There should be no adnexal or other associated trouble requiring operative removal. Painful conditions of the uterus are usually not favorably influenced by radium treatment. It is not advisable in patients in whom it is important to maintain ovarian activity. The dosage is the same as for a small myoma.

X-ray treatment in nutritive conditions of the uterus has about the same indications and contraindications as radium. Radium carries the advantage of being placed directly in the diseased organ, while the x-ray must be shot through abdominal wall and the intestinal coils, with resulting gastrointestinal upset.

CHAPTER VI.

MYOMA OF THE UTERUS.

The operative treatment of uterine myomata comprises myomectomy, resection of the corpus uteri, supravaginal hysterectomy, complete hysterectomy and palliative operations. These procedures may be carried out through an abdominal incision or by way of the vagina. The subject will be presented in three divisions—(a) technique, (b) indications for operative treatment, (c) selection of operative method.

TECHNIQUE OF OPERATIONS.

In the description of technique, the operative procedures will be taken up in the order of the frequency of their use. The abdominal operations will be considered first and then the vaginal, as follows:

Abdominal Supravaginal Hysterectomy.
Abdominal Complete Hysterectomy.
Abdominal Myomectomy.
Abdominal Resection of Corpus Uteri.
Vaginal Hysterectomy.
Vaginal Myomectomy.
Vaginal Resection of Corpus Uteri.
Vaginal Amputation of Corpus Uteri.
Palliative Measures.

Supravaginal Hysterectomy (Abdominal).

When the abdomen has been opened, the pelvis is explored, the tumor and its relation to the uterus investigated, the complications determined and the character of the operative procedure decided upon. This investigation may require extensive separation of adhesions if there is complicating inflammation. Should there be any probability of pus, the patient's pelvis must be kept low and the upper abdominal cavity protected by gauze during the process of separation. Removal of the adnexa, on one or both sides, may also be required.

The technique of supravaginal hysterectomy will be taken up as follows:

Regular steps:

1. Exposing the vessels.
2. Catching and dividing the upper vessels.
3. Separating the bladder.

4. Catching and dividing the uterine vessels.
5. Dividing the cervix.
6. Treatment of the pedicles.
7. Toilet of the peritoneum.

Variations in technique:

Primary ligation instead of clamping.
Removal of adnexa.
Preliminary enucleation of fibroid nodules to permit access to vessels.
Catching the vessels from below upward.
Provision for vaginal drainage.

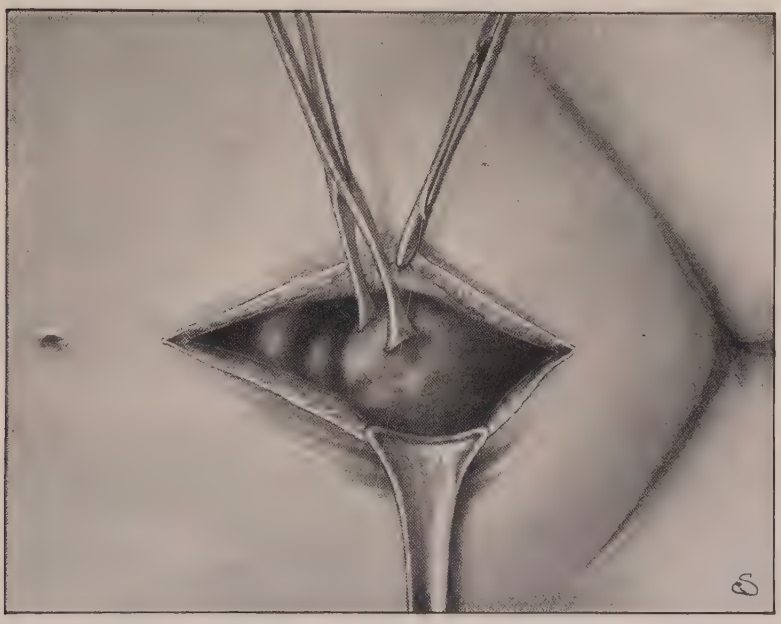


Fig. 384. Abdominal Hysterectomy for Myoma. The abdomen has been opened and the intestines pushed out of the way. The myomatous uterus has been grasped with a heavy-toothed forceps and is being raised out of the cavity. It is preferable to grasp a tumor-nodule rather than the uterus itself, because of the danger of a forceps-tooth penetrating to the uterine cavity, which may contain infectious fluid. When practicable it is better to grasp the broad ligament of each side for traction, as explained in the text.

Regular steps. *1. Exposing the vessels.* The myomatous uterus is grasped with a strong forceps (Fig. 384) and brought up through the abdominal incision (Fig. 385), the intestines having been previously cleared out of the pelvis by the Trendelenburg posture and gauze packing. A large heavy toothed forceps is good for the required traction on the mass. A toothed forceps should on no account, however, be applied in such a way that the teeth are likely to penetrate to the uterine cavity. The fluid of the cavity may be infective, and probably is infective if there has been persistent bloody and mucopurulent discharge. Such fluid will leak through the puncture holes, which may also become enlarged by the strong traction. Caution in this respect is especially important in those

Fig. 385. The uterus has been drawn out and to the left so as to expose the right adnexa and round ligament, preparatory to clamping the same. In grasping the uterus care should be taken that the teeth of the forceps do not penetrate to the uterine cavity, which may contain infective fluid. It is safer to grasp a nodule of the tumor rather than the corpus uteri, and still safer to grasp the broad ligaments for traction as previously mentioned.

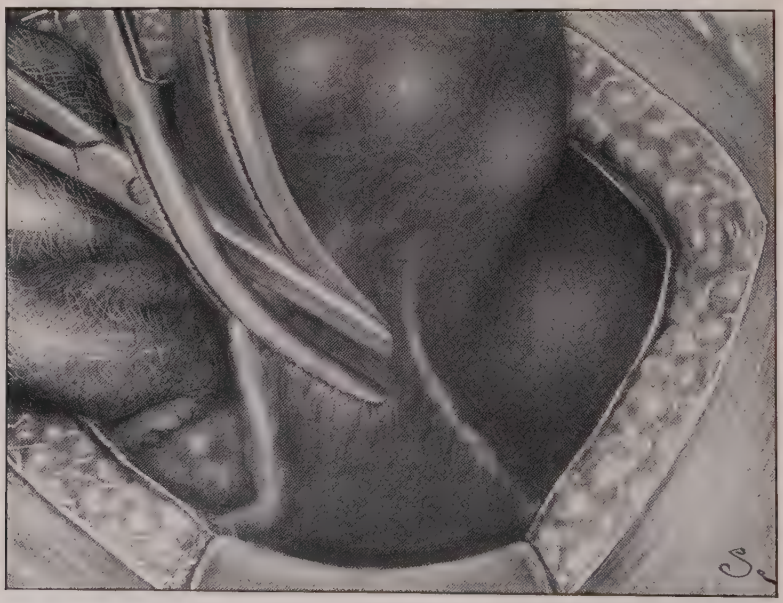


Fig. 386. The right tube and accompanying vessels have been double-clamped near the uterus and are being divided by scissors. The adnexa are to be preserved.

cases where there may be a sloughing submucous myoma or an associated carcinoma of the endometrium. It is safer to grasp some nodule of the tumor, rather than the corpus uteri itself. In those cases where a safe hold cannot be secured by the heavy toothed forceps, the author depends for traction on a heavy pressure forceps which grasps the broad ligament close by the side of the uterus. This has proved so satisfactory that he uses it now as the routine method. This forceps embraces the tube and round ligament and utero-ovarian ligament, and extends halfway down the side of the uterus. Thus applied, it clamps the upper broad ligament vessels on the uterine side and obviates the necessity of applying other forceps for that purpose. Also, it prevents regurgitation of fluid from the uterus, compressed in the manipulations, back

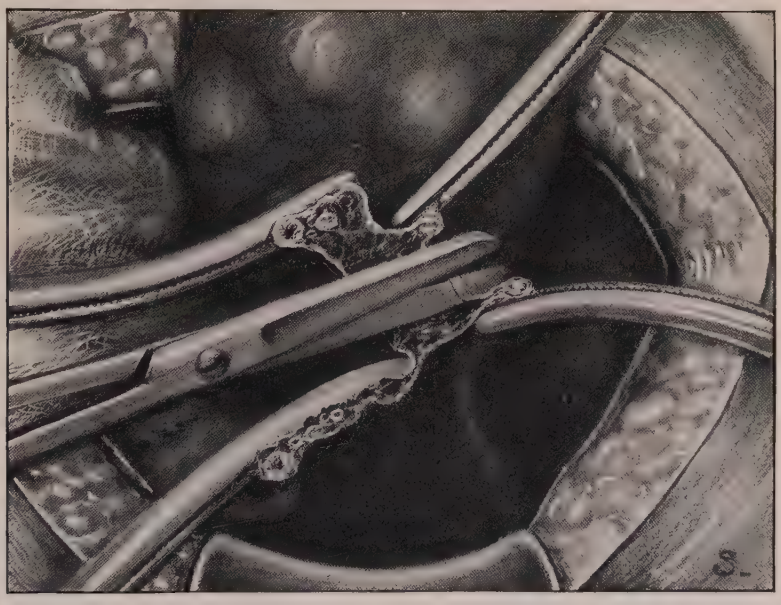


Fig. 387. The right tube and round ligament have been divided and the anterior peritoneal layer of the broad ligament is being raised and divided. The proximal clamps (those between the pelvic wall and the line of incision) should not extend low enough to interfere with this early separation of the anterior layer of the broad ligament which facilitates very much the rapid separation of the vesical flap of peritoneum and also the satisfactory separation of the deep-vessel pedicle at the side of the uterus and the clamping of the same.

through the tubes. The danger of this regurgitation has been strongly emphasized by Sampson, in connection with his work on the implantation of endometrial elements on the ovary and other peritoneal surfaces.

In some cases the tumor cannot be brought out of the abdomen. The incision must then be widely opened and the vessel areas exposed by pulling the tumor to one side. In exceptional cases, the vessels cannot be reached until some of the tumor has been removed, as explained later under variations in technique.

2. Catching and dividing the upper vessels. The Fallopian tube and underlying vessels of one side are divided between clamps, as shown in Fig. 386. The

round ligament is likewise divided (Fig. 387), after which the anterior layer of peritoneum is raised and divided downward and then across onto the anterior surface of the uterus. On the uterine side, the vascular structures may all be caught in one forceps if desired, and this forceps may be used also for traction as already explained. The other side is then treated in the same way (Figs. 388 and 389).

The usual relations here indicated, are of course not always maintained. In some cases the structures are so displaced and distorted by the tumor, that it is difficult to locate the main vessels. Also, there may be many additional vessels requiring ligation.

3. Separating the bladder. After the upper portions of the broad ligaments are cut away, the vesico-uterine fold of peritoneum is lifted from the front of the uterus and divided across, as indicated in Fig. 389. The bladder is then pushed off the uterus with the gauze-covered finger (Fig. 390) or with gauze held in forceps. This separation is continued down to the upper part of the cervix and then below any tumor nodule that may extend lower.

4. Catching and dividing the uterine vessels. The uterus is pulled strongly upward and the bladder peritoneum is drawn forward. Guided by palpation of the broad ligament with a finger behind and the thumb in front, this portion of the broad ligament, including the uterine artery close to the uterus, is clamped. The forceps should take a firm bite right up to the uterine wall so as not to miss the uterine vessels there. A strong forceps with a tooth at the end of each blade is useful here, as the teeth give an extra firm hold at the end. A second forceps is then applied near the first and the vessels are divided between them (Fig. 391). The other side is treated in the same way.

5. Dividing the cervix. With a knife the cervix is divided across, as shown in Fig. 392. It is well to cup out the cervix some, as shown in Fig. 393. After the cervix is divided and the tumor and uterus removed, the open canal of the cervical stump is sterilized by carbolic acid followed by alcohol, or by tincture iodine diluted to one-third strength and applied to the cut surface and within the canal. The canal is then closed by a suture introduced as shown in Fig. 394 and tied.

6. Treatment of the pedicles. The clamped and divided uterine vessels are now ligated, and the forceps removed. The ligatures are passed through the tissues so that there is no chance of the ligatures slipping off the ligated vessels. For this purpose a small strong full-curved needle with round point (no cutting edge) is used, as indicated in Fig. 395.

After the uterine vessels are ligated, the upper vessels and round ligaments are taken care of in similar manner, as shown in Figs. 396 to 397.

The round-ligament pedicles and the adnexal pedicles are then drawn into the cervical stump and fastened there securely, as shown in Figs. 400 to 404. If the cervical stump has been cupped out a great deal, its edges may be brought over the pedicles, as shown in Fig. 404. Ordinarily, however, the pedicle stumps are simply sutured on top of the cervical stump.

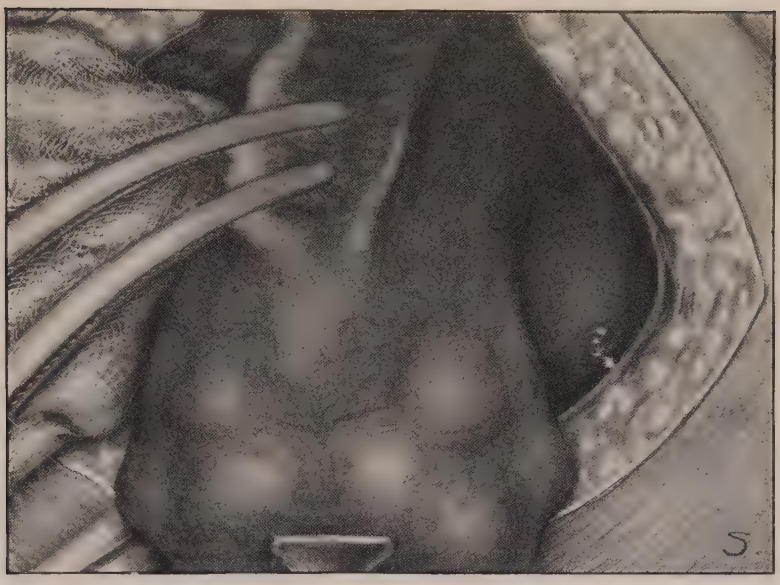


Fig. 388. The left tube and accompanying vessels clamped and ready for division. In place of the toothed forceps for traction on the uterus, with its possibility of penetration to the uterine cavity, the author now uses a large clamp on each side. This clamp is made to grasp the side of the uterus just where the broad ligament joins it, and serves for traction and for clamping the vessels from the uterus and for occluding the tube to prevent regurgitation of infective fluid from the uterus.

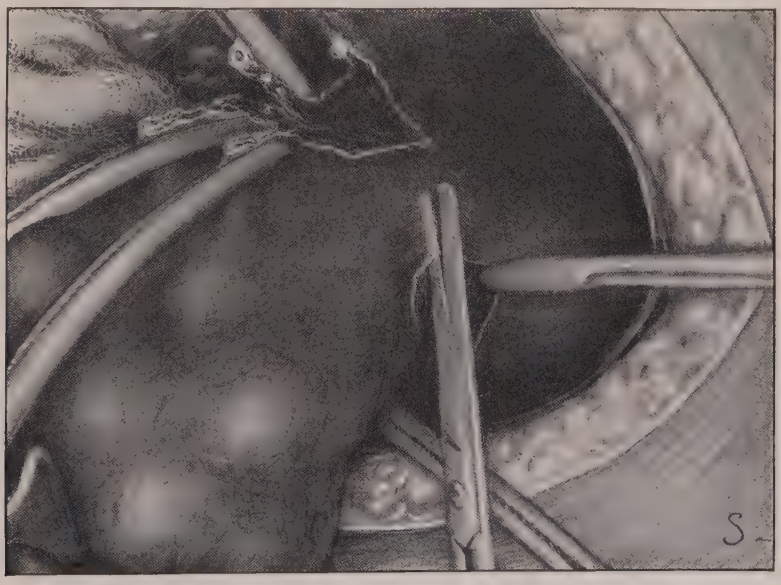


Fig. 389. The left tube and round ligament have been divided, as has also the anterior peritoneal layer of the left broad ligament, and the peritoneum in front of the uterus is being cut across, preparatory to separation of the bladder.

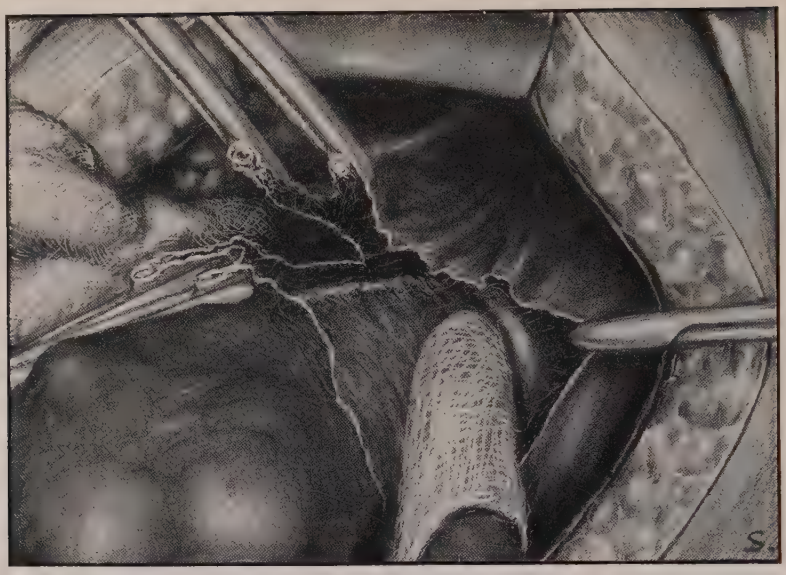


Fig. 390. The flap of peritoneum has been raised from the front of the uterus and the bladder is being separated by the gauze-covered finger. The separation of the flap of peritoneum from the front of the uterus is a very easy matter if the division of the peritoneum is made within the area of loose attachment, which extends up the anterior surface of the uterus for some distance beyond the vesico-vaginal fold. Annoying delay in the separation is caused if the cut across the peritoneum is made above this loose area.

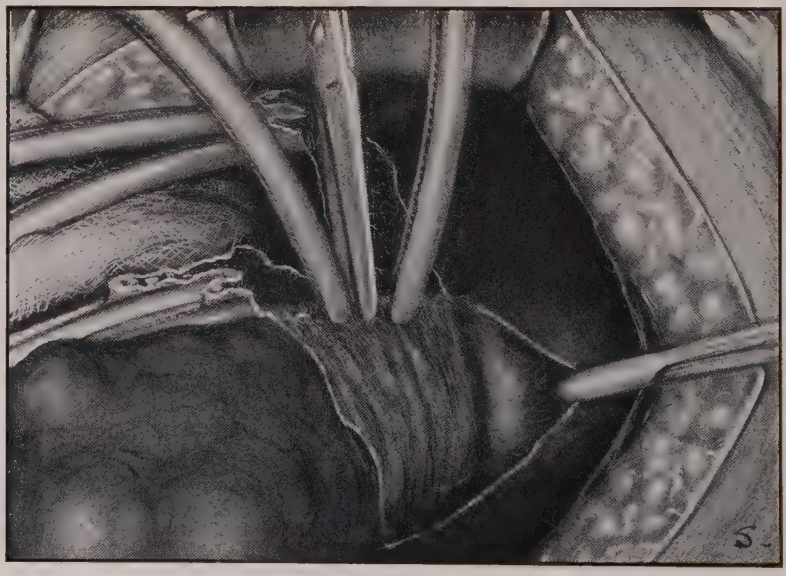


Fig. 391. The broad ligament has been clamped and divided down to the side of the uterus, the large uterine vessels have been clamped and the scissors are in place for dividing the same. For clamping these large vessels close to the uterus, toothed clamps are preferable to the ordinary clamps here shown.

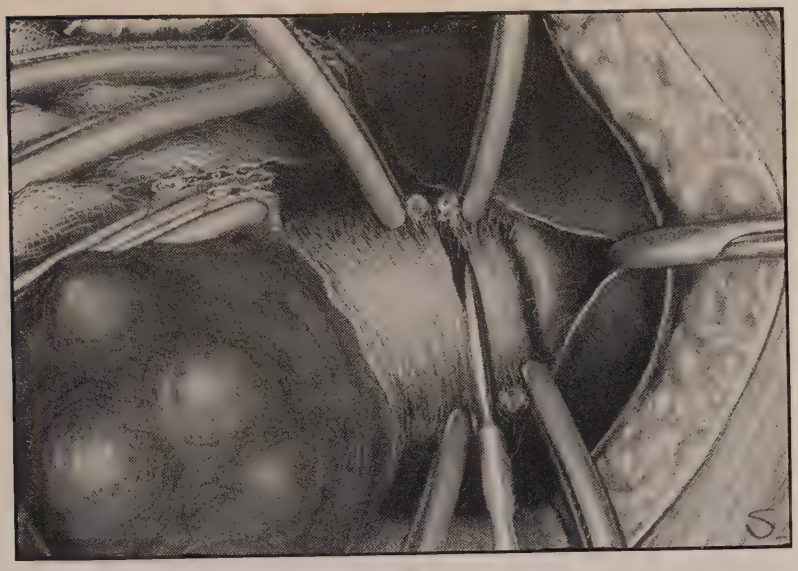


Fig. 392. All vessels have been divided and the cervix is now being cut across.

Fig. 393. Completing the division of the cervix. In cutting across the cervix it is well to hollow it out slightly, as here shown.

7. Toilet of the peritoneum. The cervical stump, with the attached pedicle ends, is covered over by the peritoneum from the front of the uterus, which was saved for this purpose (Fig. 405). Care should be taken to cover all raw surfaces in order to diminish the chance of serious intestinal adhesions. In nearly every case of intestinal obstruction from adhesions, the small intestine is the part involved. Consequently, the danger from post-operative adhesions is diminished

if the small intestine is kept away from the operative area. This may be accomplished to some extent by raising the coils of small intestine, as shown in Fig. 405, and permitting the sigmoid and cæcum to cover the area. The protection thus afforded varies much in different cases, sometimes being considerable and other times but little. If abundant and long, the omentum may be adjusted to aid in keeping the small intestine from contact with the area of danger. Fig. 406 shows the toilet of the peritoneum completed, and the abdomen ready to be closed.

Variations in technique. The variations are due to the conditions encountered or to the predilection of the operator.

Primary ligation instead of clamping. This was the method first employed. Each vascular area was ligated in two places and then divided between the liga-

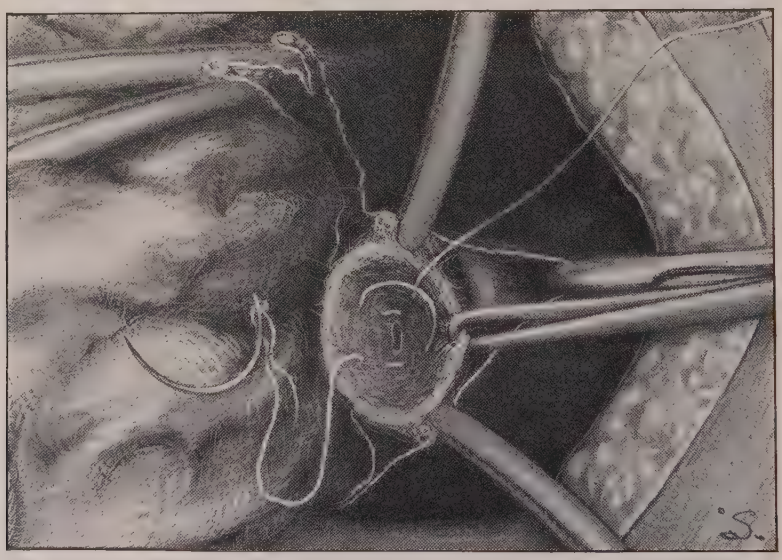


Fig. 394. The tumor and uterus have been removed, leaving the stump of the cervix. The suture for closing over the cervical canal is in place. In most cases this suture may be easily passed with the ordinary round-pointed needle. When the cervix is very firm, however, the regular cervix needle with a cutting point is preferable.

tures. Later it was found that considerable time could be saved by clamping and dividing the vessels one after another, until the uterus was removed, and then ligating the clamped vessels. As a rule, by the clamp method fewer ligatures are required, and those that are necessary can be more rapidly and accurately applied because there is more room in the pelvis, the tumor having been removed.

Recently it has been suggested that the preliminary clamping tends to cause post-operative thrombosis. This seems hardly probable, however, as the ligatures are placed proximal to the clamped area. If the forceps are left in place very long, the included tissue is more or less devitalized. After ligating, it is well to trim away any devitalized tissue, as it may interfere with the healing.

Removal of adnexa. If the adnexa are extensively diseased, they must be removed, on one or both sides. The preservation of affected adnexa, or of portions of the same, is a matter concerning which there is much difference of opinion. The operator will of course be guided in his decision by his attitude toward conservative surgery of these structures in general, the principles of which are discussed in Chapter XI.

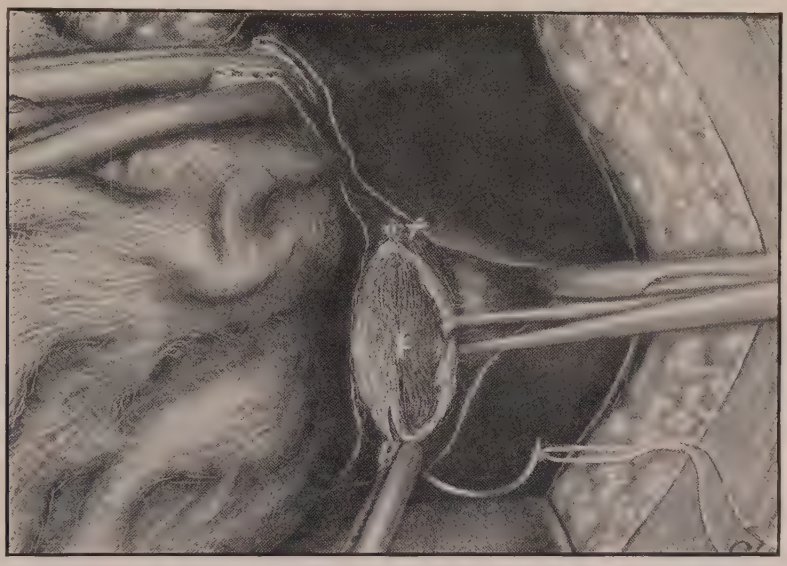


Fig. 395. The cervical canal has been covered, the left uterine vessels have been ligated and the ligature for the right uterine vessels is being passed. As an improvement over the detached ligatures, the author now uses a continuous ligature on each side as shown in Figs. 423 to 425.

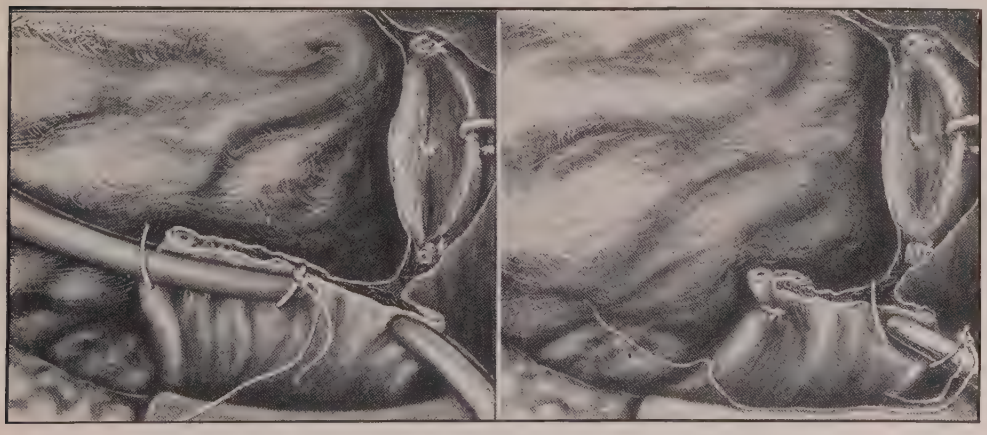


Fig. 396. Fig. 397.

Fig. 396. Ligating the adnexal vessels on the right side.

Fig. 397. The adnexal vessels have been ligated and the ligature for the round ligament is being passed.

The adnexa may be removed along with the myomatous uterus, in which case the first division of tissue is made between the ovary and the pelvic wall. The ovarian vessels are there clamped and divided, the freed adnexa raised with the tumor, and the removal of the uterus proceeded with as already described. When the adnexa are densely adherent low in the pelvis, or when they are otherwise

Fig. 398. Fig. 399.

Fig. 398. All the pedicles of the right side have been ligated.
Fig. 399. Ligating the pedicles on the left side.

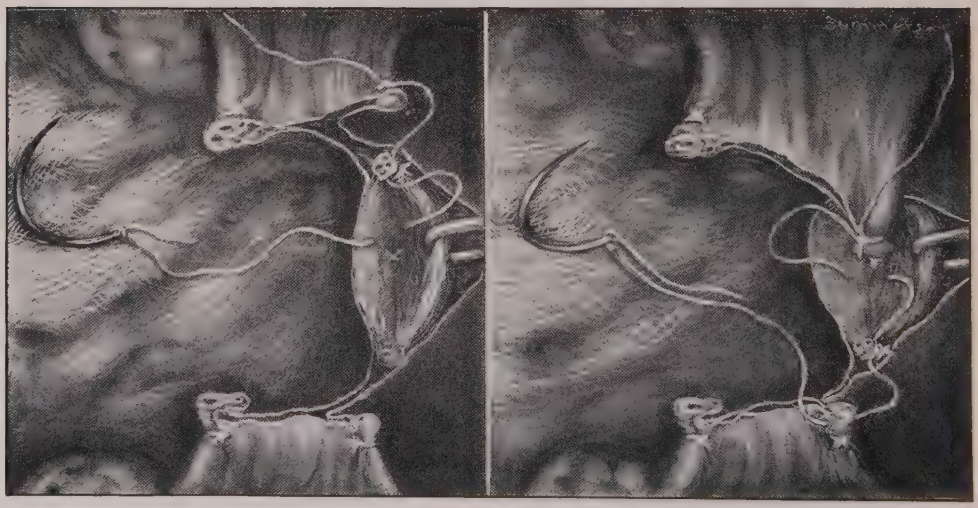


Fig. 400. Fig. 401.

Fig. 400. All the pedicles have been ligated and the suture has been passed for bringing the pedicles of the uterine vessels and the round-ligament pedicle of the left side into the cervical stump.

Fig. 401. The left round-ligament pedicle has been approximated to the cervical stump and the suture is in place for bringing down the round-ligament pedicle of the right side.

Fig. 402. Fig. 403. Fig. 404.

Figs. 402, 403 and 404. Further steps by which the round-ligament and adnexal pedicles are fastened securely to the cervical stump.

The details of ligating the pedicles and fastening them to the cervical stump vary much with different operators and in different cases with the same operator. When the adnexa are preserved, the adnexal and round-ligament pedicles of each side may be ligated with a continuous suture-ligature and then fastened to the cervical stump with the same, thus simplifying the procedure and reducing the time required. Occasionally in cases where the adnexa are removed, the pedicles are long enough to permit this ligating together. This point may be determined by noticing whether the pedicles are long or short, when they are picked up for ligation.

Fig. 405. Reducing the chance of serious adhesions. The lower coils of small intestine are being held away from the operation-area, that the sigmoid and cæcum may cover it as far as possible.

difficult to get at, it is sometimes better to remove the uterus and tumor first. This gives better access to the adherent adnexa and permits of more careful and accurate separation and ligation.

Preliminary enucleation of myoma nodules. In some cases, tumor nodules overhang the blood vessels or otherwise prevent access to them. In such cases much time may be saved by rapidly enucleating and removing as many fibroid nodules as necessary to permit easy access to the vessel. Simply make an incision over the interfering nodule and shell it out by blunt dissection. Then do the same with another, and so on until room is secured for satisfactory work in the vessel areas. Such enucleation of tumor nodules, large or small, causes but

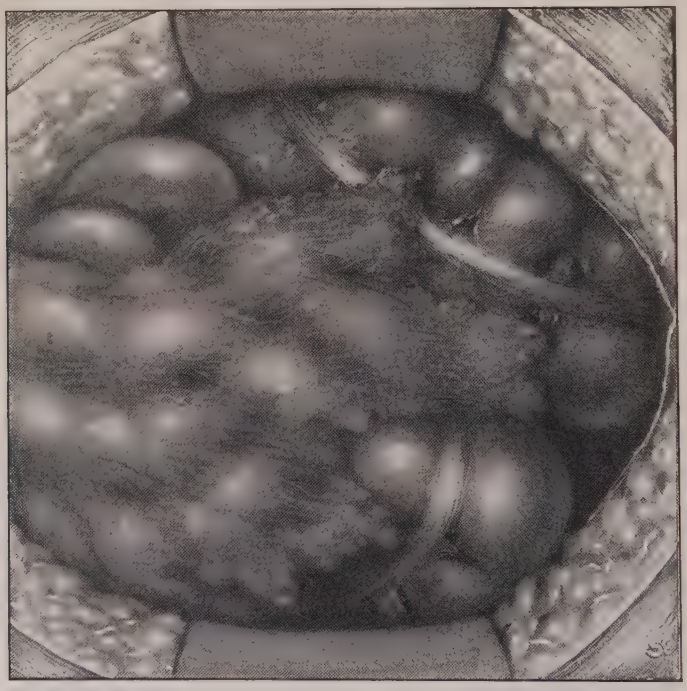


Fig. 406. Reducing the chance of serious adhesions. The omentum has been spread out beneath the abdominal incision, to prevent the coils of small intestine from coming in contact with the wound. It is adhesions to the small intestine that are most likely to cause trouble later.

little bleeding, which is easily controlled by one or two pressure forceps. This simple and useful expedient is needed especially in cases where the myomatous uterus cannot be lifted out of the pelvis on account of subperitoneal growth or on account of adhesions.

Catching the vessels from below upward. Myomata often grow in strange ways, producing fantastic shapes and unexpected relations. The operator must be prepared to deal successfully with these strange and disconcerting distortions. It requires much knowledge and ingenuity and judgment, gathered

from experience, to make necessary identifications and deal with the conditions promptly and effectively. The problem is to identify structures sufficiently to locate the main vessels and then to safely clamp and divide these vessels to allow excision of the mass. For getting at the covered vessels special expedients are from time to time necessary. Preliminary enucleation of interfering tumor nodules, already mentioned, is probably the most useful and most generally applicable expedient. In the exceptional case, where the enucleation of nodules is not applicable or does not suffice, success may be attained by the expedient of securing the covered vessels from below upward instead of from above downward. This maneuver was suggested and the details beautifully illustrated by Kelly. There are three ways of carrying it out, viz., (a) by going down one side and up the other, (b) by bisecting the myomatous uterus and catching the vessels of each side from below upward, and (c) by first cutting across the cervix uteri and then catching the vessels of each side from below upward. This exceptional expedient is of course needed only in an occasional case, but when needed it may be needed badly to expedite the operation so as to bring it within the patient's endurance.

The method of catching the vessels down one side and then cutting across the cervix and catching the vessels on the other side from below upward, is applicable in those cases where the vessels are buried out of reach on one side only, the vessels on the other side being readily accessible. The bladder is of course separated for the deep work about the cervix. The point of special danger in this operation is when approaching the uterine artery on the bad side, the incision across the cervix being almost completed. On account of the tumor, the vessel is likely to be deeply situated and, if cut across before being caught, the proximal spurting stump may retract far into the lateral portion of the pelvis, making its apprehension very difficult with the tumor still in place. To avoid this accident, the last portion of the cervical tissue should be divided with particular care, the edge of the knife being directed upward along in the edge of the uterine tissue parallel with the vessel for some distance. In the meantime strong upward traction is made on the severed portion of the cervix. This traction draws the amputated uterus away from the cervix, tears through the last shred of uterine wall and brings the underlying uterine artery clearly into view. The uterine vessels are then caught and divided between clamps. The uterus is then raised farther by traction and blunt dissection, until the ovarian vessels come within reach. They are clamped and divided, and the mass removed.

The method of bisecting the myomatous uterus to the cervix, dividing each half of the cervix from the center outward and catching the vessels from below upward on each side, is applicable in cases where the vessels of each side are inaccessible because of general enlargement of the uterus from many small myoma nodules or because of dense adhesions. The bisecting incision is made as nearly as practicable in the median line, beginning in front or above as found most convenient. The incision is carried boldly through the bulk of the uterus

and tumor, but caution must be exercised as the last portion of the posterior wall is approached. The uterine cavity should be disinfected with iodine as soon as opened. As each half of the cervix is cut across, the uterine vessels of that side are caught by the maneuver explained in the preceding paragraph. The half uterus is then further loosened by traction and dry dissection up to the ovarian vessels, which are clamped and divided, and the half uterus removed. The other half is treated in the same way.

The method of preliminary division of the cervix followed by clamping and division of the vessels from below upward on each side, is applicable to those cases in which the inaccessibility of the vessels is due to a large tumor which chokes the pelvis and lower abdomen and at the same time carries the cervix into an accessible position on its anterior surface. The distortion of structures is of

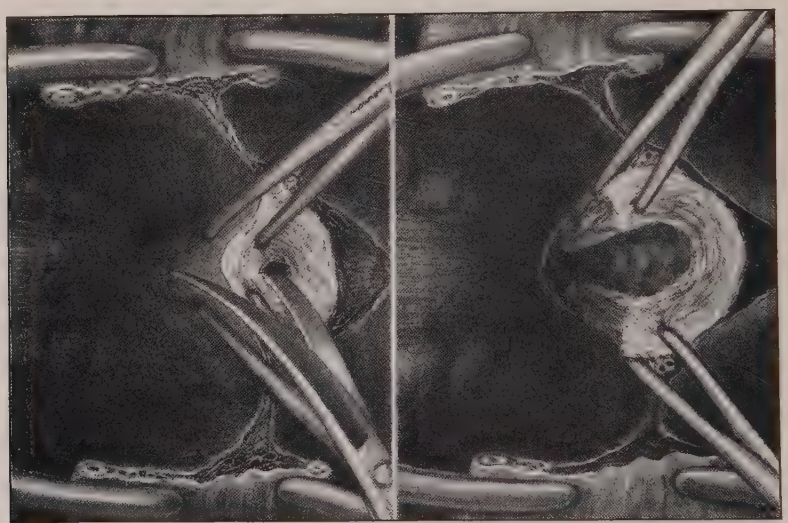


Fig. 407. Fig. 408.

Fig. 407. Drainage into the vagina after supravaginal hysterectomy. In cases where drainage is required, it may be very quickly and conveniently provided by dividing the posterior wall of the cervix.

The cervix has been grasped on each side with a tenaculum-forceps and the scissors are in place for dividing the posterior wall. One blade is introduced down the cervical canal and the other blade lies on the peritoneal surface of the cervix.

Fig. 408. The cervix has been divided and spread apart. The adjacent vaginal wall also has been divided far enough to give room for the drain.

course very marked and care must be exercised in identifying and separating the bladder. The location of the ureters also must be kept in mind and, if displaced or if the line of excision extends low on the cervix, they should be identified by palpation if possible. After free separation of the bladder and nearly complete division of the cervix, the uterine vessels of each side are brought into view, or within touch by traction on the upper portion of the divided cervix, in much the same way as mentioned in the two preceding paragraphs. The subsequent

steps of the work are also carried out in practically the same way—that is, by traction and dissection the upper vessels are finally exposed and clamped and divided, and the mass removed. There are often extraneous vessels and, as the higher portions of the mass are reached, troublesome adhesions, that require caution in the work. After the transverse division of the cervix, it may be found advantageous to bisect the uterus from below upward, either partially or completely.

Provision for vaginal drainage. When vaginal drainage is desired in a case of supravaginal hysterectomy, the most convenient way of providing for it is to split the cervix posteriorly. After the uterus is removed the cervical canal is disinfected with carbolic acid or with iodine, the posterior wall of the cervix is caught on each side with tenaculum-forceps and drawn upward. One blade of

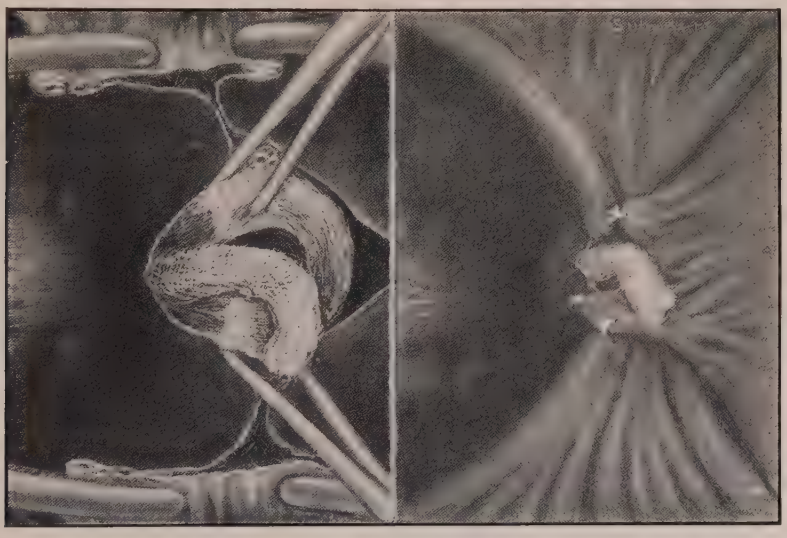


Fig. 409. Fig. 410.

Fig. 409. The drain has been placed. For this purpose the author usually uses a small piece of gauze or a folded piece of rubber dam, as recommended in complete hysterectomy, When acute inflammation is present, a tube drain, as in Fig. 624, is preferable.

Fig. 410. The anterior peritoneal flap has been closed about the drain and the latter is left extending into the peritoneal cavity.

the scissors is then pushed into the cervical canal, as shown in Fig. 407, and the cervix divided. The cut is extended down to the end of the cervix (Fig. 408) and out on the posterior vaginal wall as necessary to make room for the drainage tube or gauze. If there is bleeding from any point along the cut, it may be stopped by whipping over with one or more sutures.

In acute septic cases in which free drainage is needed, a rubber tube drain should be used, with or without gauze as preferred. In chronic cases, in which a safety vent is all that is needed, a gauze plug may be used (Figs. 409 and 410), to be removed in four or five days or earlier if conditions requiring drainage develop.

Complete Hysterectomy (Abdominal).

When the cervix is removed, the hysterectomy is designated as complete hysterectomy. The first part of the operation is carried out the same as for supravaginal hysterectomy. The special steps in complete hysterectomy are as follows:

1. Preliminary disinfection of the vaginal vault and uterine cavity.
2. Additional separation of bladder.
3. Division of tissues beside cervix.
4. Opening of vagina and excision of cervix.
5. Treatment of vaginal stump.

1. Disinfection of the vaginal vault and uterine cavity. Tincture of iodine diluted to 2 per cent or picric acid 5 per cent in alcohol may be used for disinfection. The author prefers the picric solution for both vaginal disinfection and skin disinfection. This is swabbed freely in the vaginal vault before the anesthesia is begun. The picric solution is carefully worked into all the irregularities of the vaginal wall and then the excess is removed. This is sufficient for the case in which there is no infective discharge from the uterus. Where there is an infective or suspicious discharge from the uterus, it is well to pack the uterine cavity with gauze moistened with the above mentioned picric solution, and then close the cervix with one or two double sutures, as shown in Fig. 455, A and B.

2. Additional separation of bladder. As the bladder is being separated, as for supravaginal hysterectomy, the separation is carried farther down (Fig. 411) so as to expose the whole of the cervix instead of just its upper part. Before or after the uterine vessels are divided (Fig. 411), the bladder is pushed well off the cervix laterally. This separation of the bladder laterally is carried out some distance on the broad ligament of each side as indicated in Figs. 411 and 412. This maneuver is to carry the bladder and ureters out of the way of the forceps and ligatures that must be subsequently applied to the broad ligaments. The point as to whether or not the separation of the bladder downward or laterally has been carried far enough, is determined by palpation with the thumb and finger, as shown in Figs. 412 and 413.

3. Division of tissues beside cervix. With strong pressure forceps, preferably toothed at the end to prevent slipping, tissues lateral to the cervix are caught and then divided (Fig. 412). The bite of the forceps should be as close as possible to the cervix, so as to be well away from ureters. It is well to take short bites instead of long ones, as the subsequent ligatures are then more easily applied. Two or three bites on each side are usually required to free the cervix down to the vaginal wall. Palpation of the cervix, as indicated in Figs. 412 and 413, will show whether or not the division has been carried far enough.

4. Opening of vagina and excision of cervix. It is difficult to determine at just what point the vaginal wall is reflected from the cervix. A longitudinal in-

cision, made as indicated in Fig. 414, crosses the line of reflection. Such an incision opens the vagina and at the same time reveals the exact point of its attachment to the cervix. The vaginal wall is caught with a forceps on each side at the point of reflection (Fig. 415). With scissors the vaginal wall is divided close to the cervix (Fig. 415), the division extending as far around on each side

Fig. 411. Complete Hysterectomy—Removal of the Cervix Uteri. The bladder has been separated down still farther and the vascular tissues beside the uterus have been clamped and are being divided. For catching these deep tissues beside the cervix the toothed clamps (Fig. 810,m) are preferable to the ordinary clamps here shown.

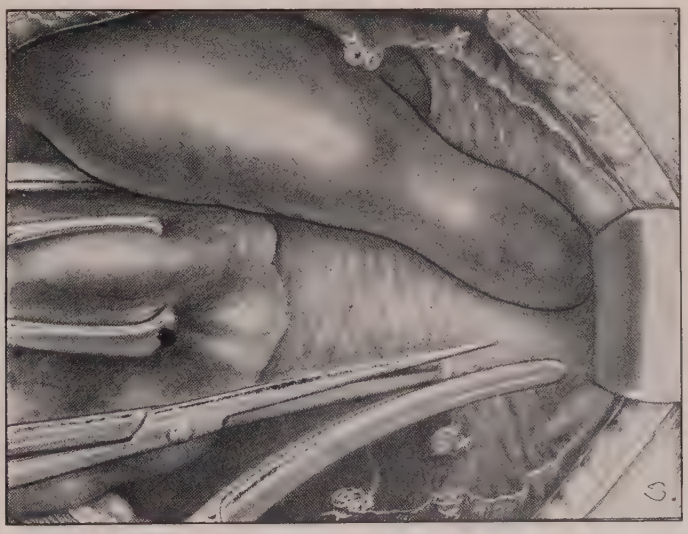


Fig. 412. Determining if the separation of the bladder has been carried far enough. With the thumb in front and the fingers behind the vagina, the lower margin of the cervix is located by touch, as indicated by Fig. 413.

as practicable, as shown in Fig. 416. The cervix is then seized with a tenaculum-forceps (Fig. 416) and drawn upward and the posterior portion of the vaginal wall divided, as indicated in Fig. 417. As the vaginal wall is divided, it is caught at intervals with forceps, as shown in Figs. 416, 417 and 418.

The disinfection of the vaginal surface, exposed in the removal of the cervix, is important. The preliminary preparation of the vagina with picric solution,

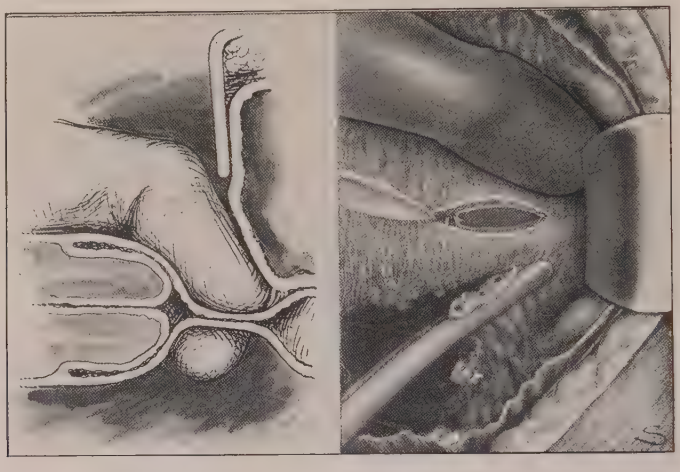


Fig. 413. Fig. 414.

Fig. 413. Sectional view, showing the method of gauging the amount of bladder separation required.

Fig. 414. Making the longitudinal incision to open the vagina and also to determine the exact location of the vagino-cervical junction.

Fig. 415. Fig. 416.

Fig. 415. Dividing the vaginal wall around the cervix.

Fig. 416. Continuing the division of the vaginal wall. This is facilitated by grasping the cervix with a tenaculum-forceps, as here shown, and drawing it strongly upward.

as already mentioned, is helpful. Disinfection from above also is advisable. As soon as the vagina is opened, a small strip of gauze, about as thick as the finger and six inches (15 cm.) long, is moistened with the picric solution and pushed into the cut and down the vagina. This disinfects the sides of the cut and the adjacent vaginal surfaces. Also the gauze, as it is

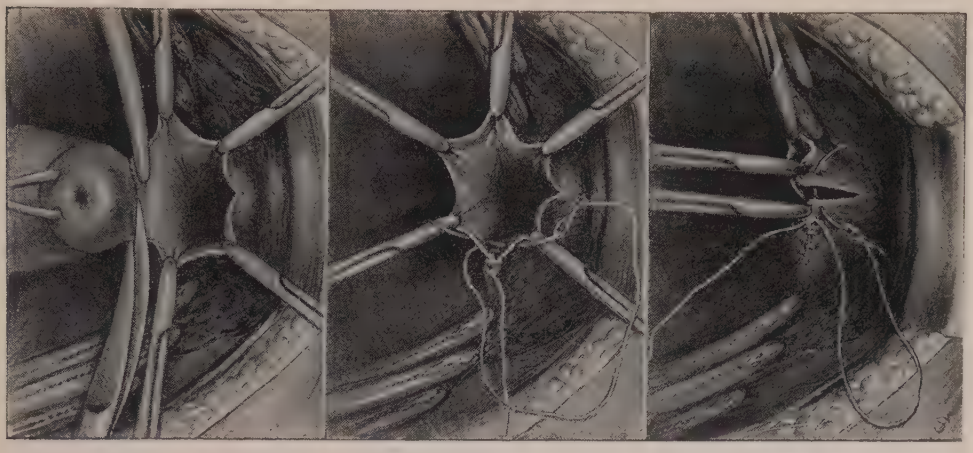


Fig. 417. Fig. 418. Fig. 419.

Fig. 417. Dividing the last portion of the vaginal wall back of the cervix.

Fig. 418. The uterus removed and the vaginal wall caught all around with forceps. Beginning to close the vaginal vault, starting with the right side.

Fig. 419. The right side of the vault closed and the closure of the longitudinal incision started.

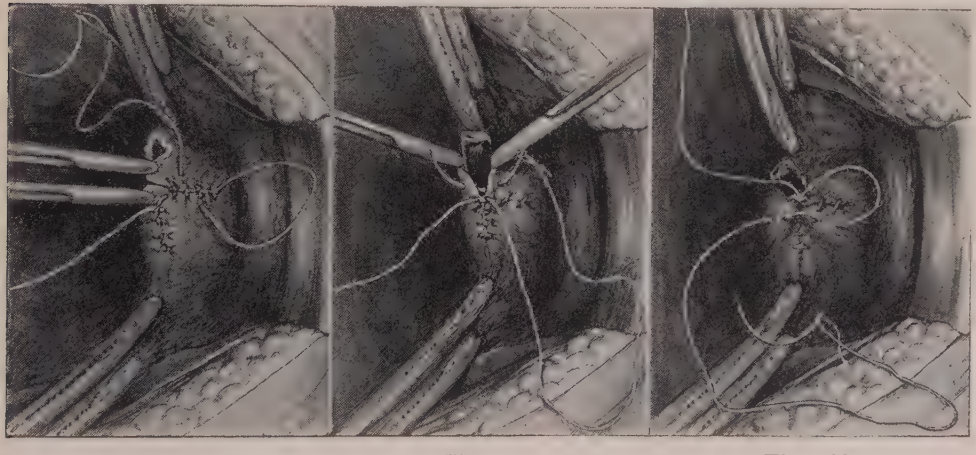


Fig. 420. Fig. 421. Fig. 422.

Fig. 420. The longitudinal portion of the vaginal incision closed.

Fig. 421. The rubber-dam drain in place and the vaginal vault being closed securely about it.

Fig. 422. The vaginal vault closed entirely and the closed margin being inverted by another suture.

pushed down the vagina, carries with it any fluid that may have been squeezed from the uterus during the preceding steps of the operation.

5. Treatment of vaginal stump. The open end of the vagina is closed about a rubber dam drain as shown in Figs. 418 to 422. The pedicles are then sutured down to the vaginal stump, as shown in Figs. 423 to 428.

After the vaginal stump and pedicle ends have been fastened together the region is closed over by peritoneum as in supravaginal hysterectomy (Figs. 429 to 431). If there is accompanying inflammation, requiring drainage of the pelvic peritoneal cavity, the drain (tube or gauze) is not covered by the peritoneal flap. If no peritoneal drainage is required, the whole area is covered by the flap of peritoneum.

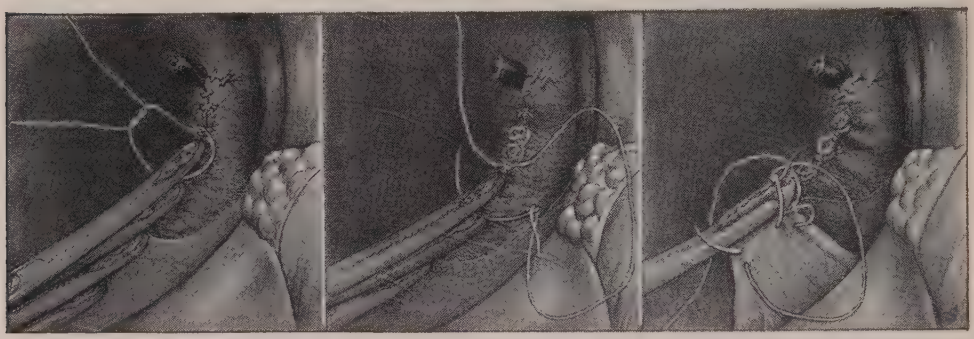


Fig. 423. Fig. 424. Fig. 425.

Fig. 423. Ligating the vascular pedicles on the right side. The first bite of the ligature. A continuous suture-ligature, as here shown, is preferable to detached ligatures.

Fig. 424. Progressing up the side of the pelvis.

Fig. 425. Ligating the suspension-ligament area. Special precautions are here necessary to guard against slipping of the ligature and secondary hemorrhage.

Fig. 426. Fig. 427. Fig. 428.

Fig. 426. Bringing down the pedicles to the vaginal vault. The first step.

Fig. 427. Pedicles on left side sutured securely to the vaginal vault, and the suture in place for bringing down the pedicles on the right side.

Fig. 428. Both pedicles sutured to the vaginal vault. Taking up the slack in the round ligaments in order to hold the vaginal vault well up and prevent shortening of the vagina.

Excision of Cervical Mucosa.

Excision of the cervical mucosa has been suggested as a substitute for removal of the cervix in cases associated with chronic endocervicitis. After the uterus has been removed, the cervical canal is closed by a suture which takes

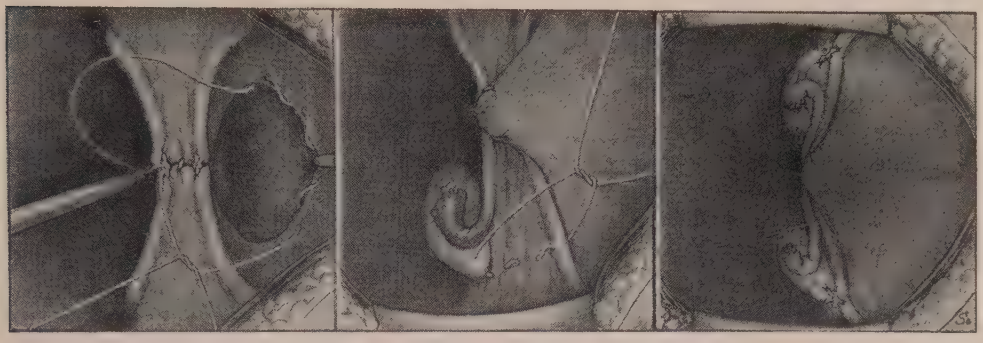


Fig. 429. Fig. 430. Fig. 431.

Fig. 429. Bringing up the margin of the posterior raw area, so as to eliminate raw surfaces as far as practicable. This suture also draws back the bladder-peritoneum.

Fig. 430. The bladder-peritoneum sutured back, to cover the pedicle area and minimize adhesions. The suture has been passed for raising the right ovary up out of the posterior culdesac.

Fig. 431. Each ovary sutured up to the round ligament on that side. This prevents the preserved ovary from dropping into the culdesac, where it is confined in such a small space that moderate enlargement is likely to cause serious discomfort.

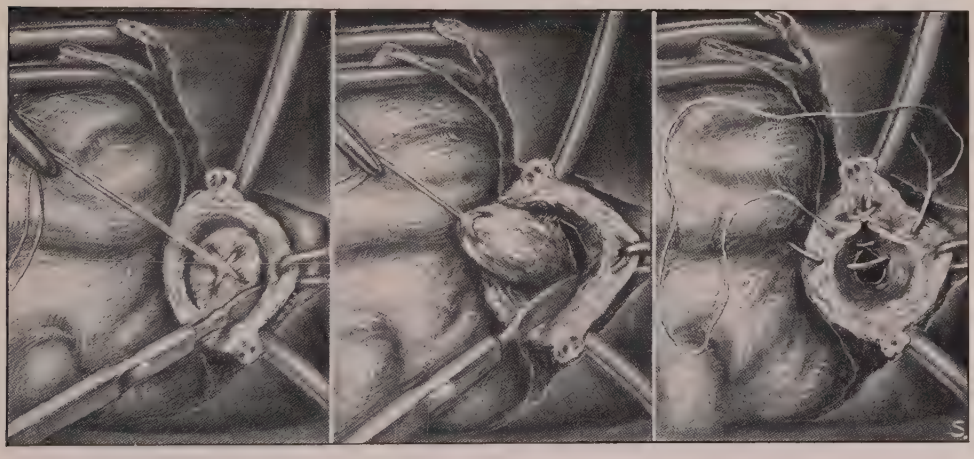


Fig. 432. Fig. 433. Fig. 434.

Fig. 432. Excision of the Cervical Mucosa. A strong traction-ligature is placed about the cut end of the cervical canal and the tissues about it are divided by circular incision as here indicated.

Fig. 433. By strong traction the central core of the cervix is drawn out, as more and more tissue is divided, until finally the excision of the central area of the cervix is complete.

Fig. 434. After excision of the central portion of the cervix, the opening may be closed by a suture, as here indicated, or if preferred, a drain may be put in.

deep hold near the canal (Fig. 432), and the suture is left long for traction. As traction is made on the suture, a core is cut out of the cervix with a knife, as shown in Fig. 433. As a cut is made around, the core may be pulled farther out, and another circular cut is made, and so on until the central portion of the cervix is completely removed, as indicated in Fig. 434.

Theoretically this is ideal, removing the cystic area entirely without necessitating ligation of vessels or suture of the vaginal wall. Practically, however, this excision of the central portion of the cervix is more troublesome than appears at first glance. In the author's experience it has seemed more troublesome and less effective than removal of the cervix as in complete hysterectomy.

Myomectomy (Abdominal).

Myomectomy is removal of the tumor only, the uterus being preserved. The technique is simple. The overlying tissue is divided, as in Fig. 435, and the tumor enucleated by blunt dissection, as shown in Figs. 436 and 437. Bleeding vessels in the cavity are caught and ligated and the general oozing is stopped by

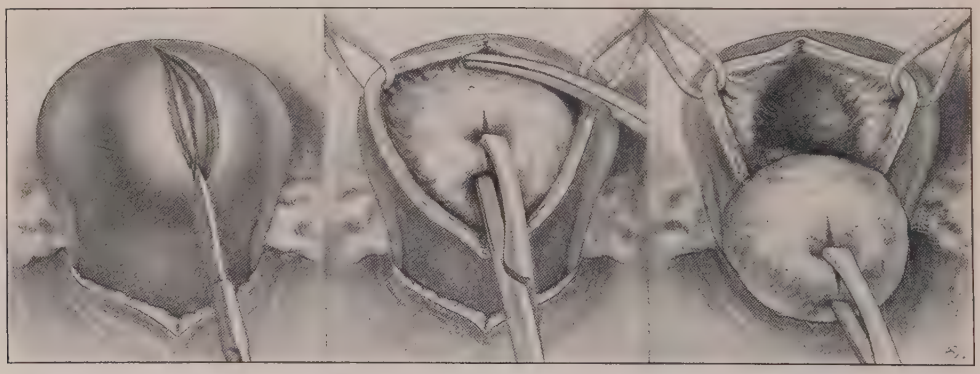


Fig. 435. Fig. 436. Fig. 437.

Fig. 435. Abdominal Myomectomy. Dividing the portion of uterine wall lying over the tumor.

Fig. 436. Enucleating the tumor.

Fig. 437. The tumor enucleated and almost removed.

buried sutures which approximate the walls (Figs. 438 and 439). Special care must be exercised to see that all oozing is checked and that the buried sutures do not constrict the tissues in a way to lead to necrosis from the reparative swelling. It is this chance of oozing or of pressure necrosis that makes myomectomy more dangerous, as a rule, than supravaginal hysterectomy. After the deeper portion of the wound has been taken care of, the superficial portion is closed by one or two rows of sutures, the last row of which must make accurate approximation of the peritoneum as indicated in Fig. 440.

The above description is of a typical myomectomy of moderate severity. Of course cases vary greatly. If the myoma nodule to be removed is pediculated it

is a much more simple affair, as indicated in Fig. 441. On the other hand, in some cases the tumor extends so deeply that its removal necessitates opening the uterine cavity. This increases the chance of infection. The opening in the uterine cavity, with or without iodine disinfection, as preferred, is closed by

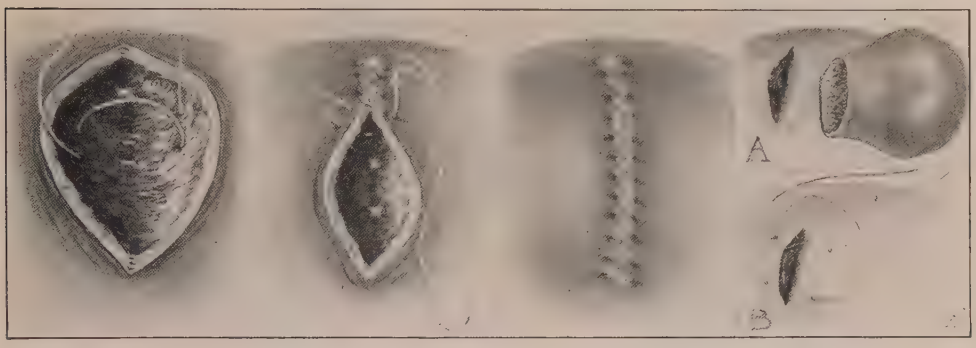


Fig. 438. Fig. 439. Fig. 440. Fig. 441.

Fig. 438. The deep sutures, to check oozing and close the deeper portion of the cavity.

Fig. 439. Closing the more superficial portion of the cavity.

Fig. 440. The closure completed. The peritoneum must be accurately approximated, an extra suture row being employed for that purpose if necessary.

Fig. 441. *A.* and *B.* The excision of a pedunculated myoma.

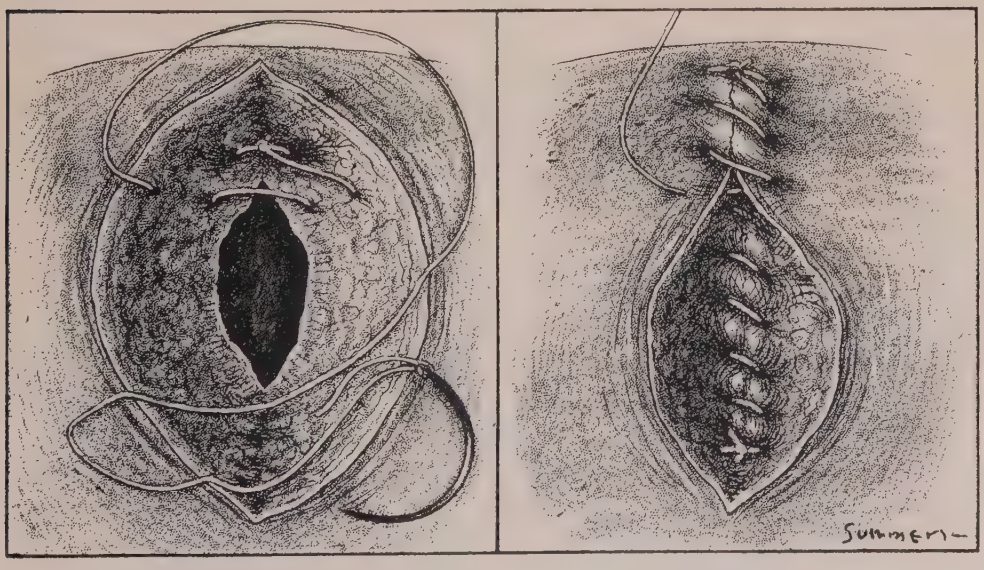


Fig. 442. Fig. 443.

Fig. 442. Myomectomy, when the tumor extends so deeply that the uterine cavity is opened. The method of passing the sutures for the closure of the uterine cavity is here shown, continuous or interrupted sutures being used as preferred.

Fig. 443. The deeper portions of the wound have been closed, and the superficial portion is being sutured.

sutures that pass close to, but not through, the mucosa, as shown in Fig. 442. The remaining part of the wound is then closed in the usual way, as indicated in Fig. 443.

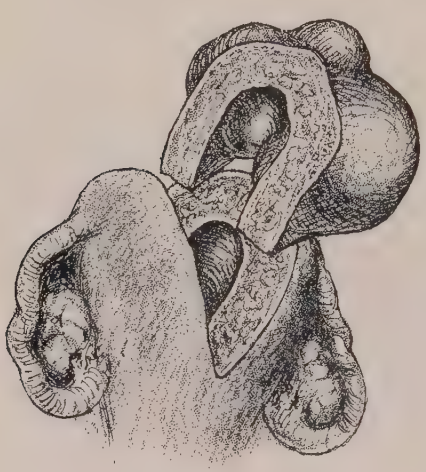


Fig. 444.

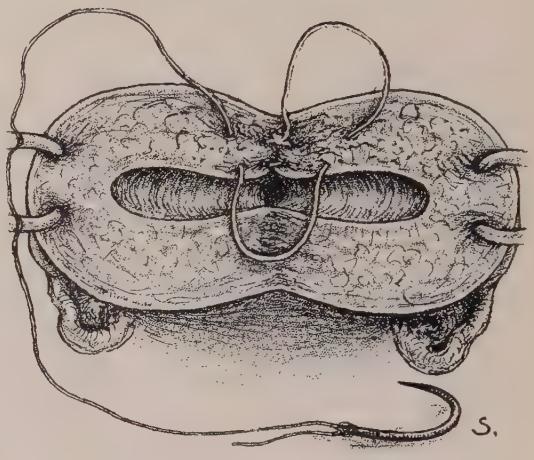


Fig. 445.

Fig. 444. Resection of the Corpus Uteri. This illustration shows the wedge-shaped resection, by which the myomatous area may be removed in some cases.

Fig. 445. The first step in the closure of the resection wound. This line of sutures, continuous or interrupted, as preferred, is continued all the way around the exposed endometrium, until the cavity is closed.

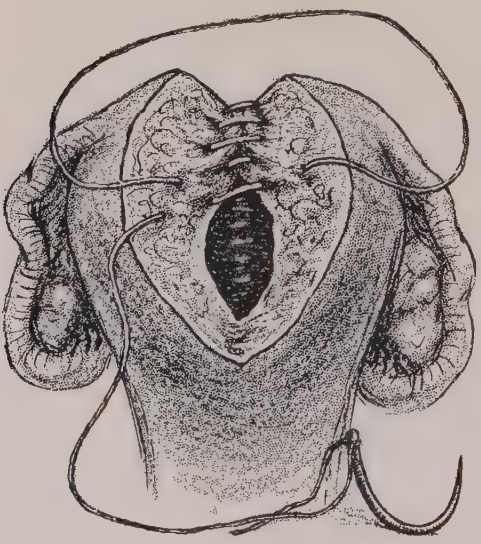


Fig. 446.

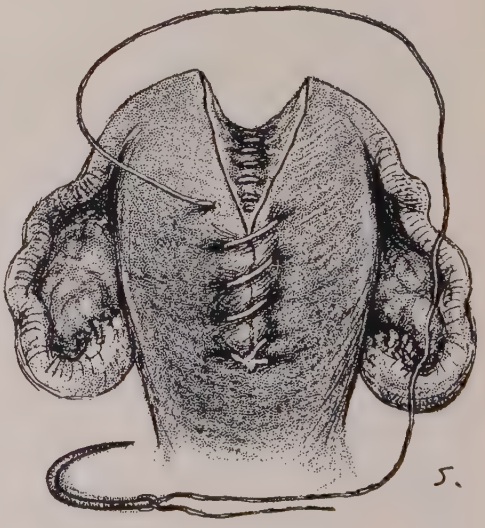


Fig. 447.

Fig. 446. The closure of the cavity almost completed.

Fig. 447. The cavity has been closed and the more superficial portions of the incised wall are being sutured.

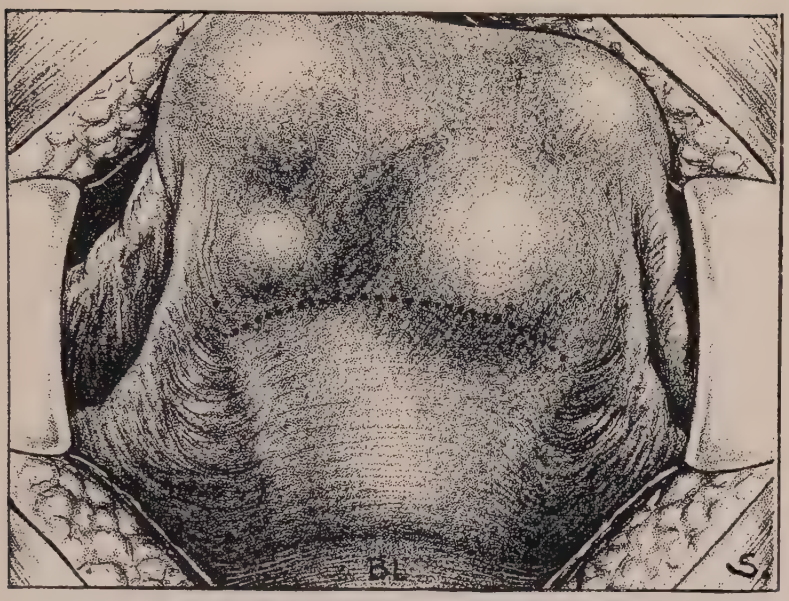


Fig. 448. Horizontal Resection of the Corpus Uteri. This is applicable in certain cases in which the myomatous nodules are confined to the upper portion of the uterus. The lower limit of the excision is indicated by the dotted line.

When a portion of the corpus uteri can be thus preserved menstruation may continue, much to the patient's benefit in some cases.

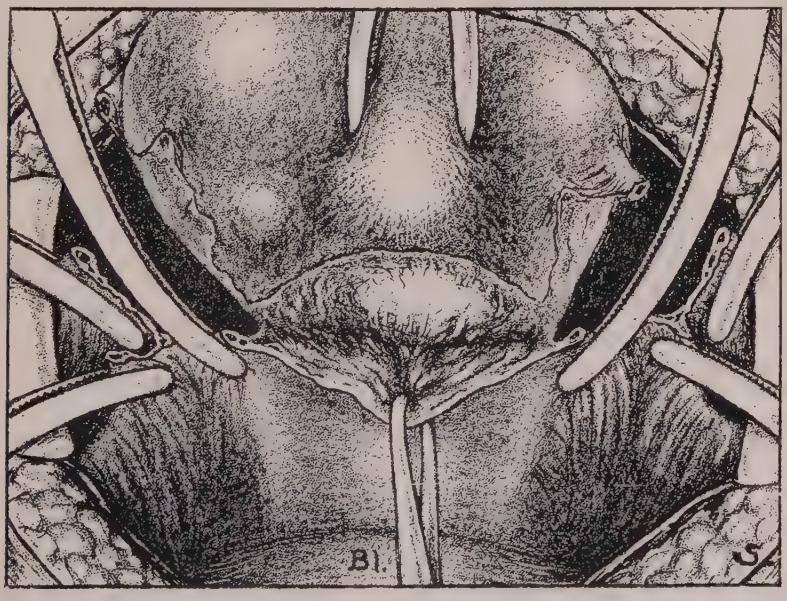


Fig. 449. All vessels above the line of excision have been clamped and divided and the mass has been partly excised.

Resection of Corpus Uteri (Abdominal).

In certain cases in which myomectomy is not practicable, the myoma nodules are so disposed that the affected portion of the uterus may be removed, preserving the remainder. This, of course, carries considerably more danger than hysterec-

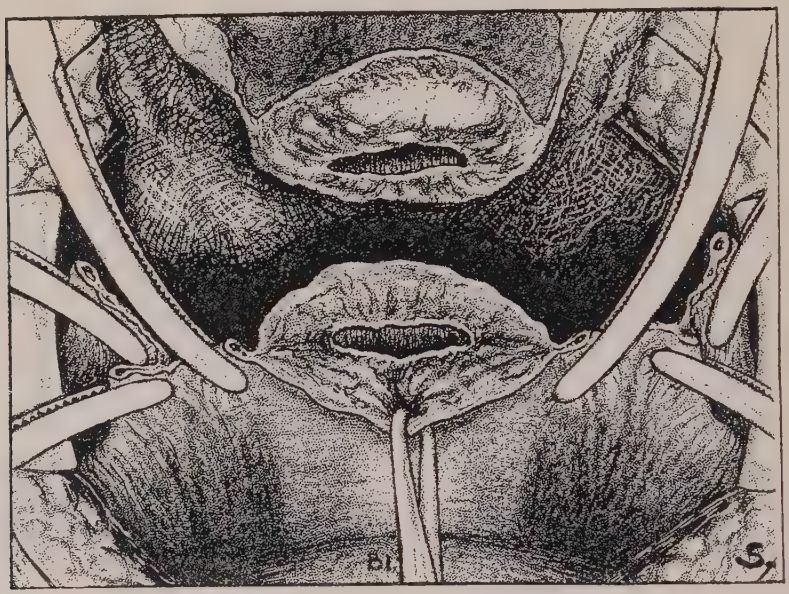


Fig. 450. The excision completed.

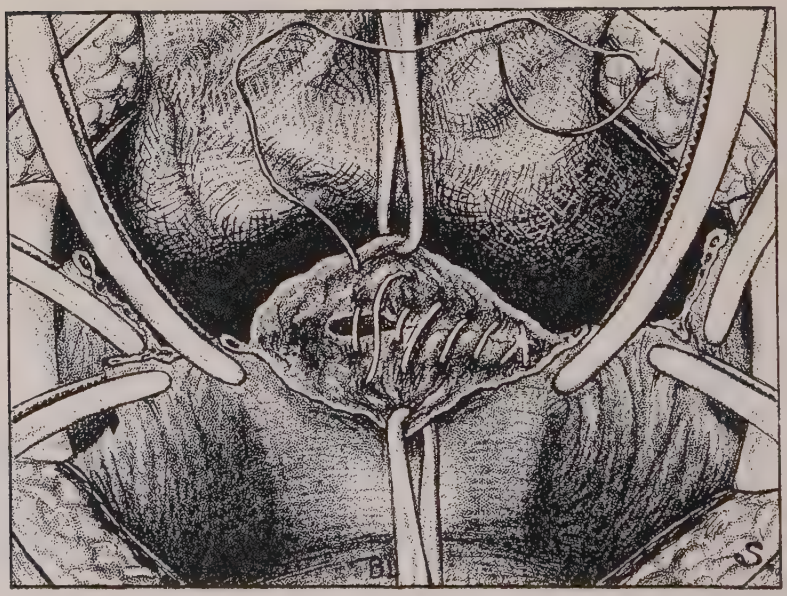


Fig. 451. Closing the uterine cavity.

tomy, but in selected cases the preservation of the uterus is well worth the additional risk. There are two methods of resection, or partial amputation as it is also designated. The choice of the one or the other depends upon the location of the collection of myoma nodules.

Wedge-shaped resection. When the tumors are situated principally in the central portion of the fundus and corpus uteri, this area may be removed as a wedge, as shown in Fig. 444. If the line of excision extends near the uterine margin, a rubber-covered forceps applied on each side will give temporary control of the bleeding. The forceps must be applied lightly to avoid injury to the lateral structures and should be removed as soon as the incisions are completed and the wounds sutured sufficiently to give control of the bleeding. If preferred, the vessels may be controlled by digital pressure by an assistant. Simple traction by forceps attached to the margins of the wound goes far towards controlling the bleeding. Of course, in some cases the vascular supply has been much augmented because of a large tumor, which fact must be considered in arranging for control of the vessels.

After the wedge has been removed, the edges of the opening into the uterine

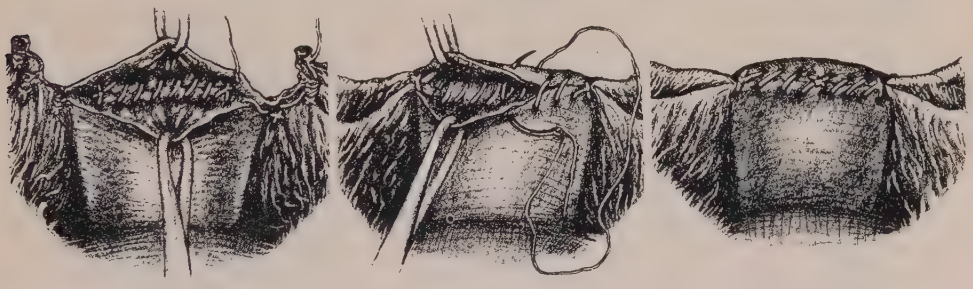


Fig. 452. Fig. 453. Fig. 454.

Figs. 452, 453 and 454. Various steps in bringing down the pedicles and completing the closure of the incision.

cavity are approximated all around by sutures that take good hold of the muscular wall and pass close to, but not through, the mucosa, as shown in Figs. 445 and 446. The remaining portion of the wall is then closed by one or two layers of sutures that securely approximate the muscular walls and the peritoneal margins (Fig. 447). It is necessary that there be accurate approximation of peritoneum to peritoneum, with all margins turned in and covered, even though a special row of sutures be required for that purpose.

Horizontal resection. When the upper third or upper half of the corpus uteri is occupied by tumors all the way across, this area may be removed by excision horizontally, as indicated by the dotted line in Fig. 448. This method of resection is carried out like a supravaginal hysterectomy except that, instead of catching the vessels all the way to the cervix and cutting across the uterus at that point, the vessels are caught only to the line of excision and the uterus is cut

across there. The ovarian vessel, round ligaments and uterine vessels are caught and divided and a cut is made across the front of the uterus as shown in Fig. 449. The amputating cut is then completed and the upper part of the uterus with the contained tumor is removed (Fig. 450). The open uterine cavity is then closed (with or without iodine disinfection, as preferred) by sutures which go close to the mucosa but not through it (Fig. 451). The clamped adnexal pedicles are then ligated and drawn into the uterine wound and the uterine wall closed over them, as indicated in Figs. 452, 453 and 454. The peritoneal surfaces are to be securely approximated and all raw edges covered.

Vaginal Hysterectomy.

In general, vaginal hysterectomy in preference to abdominal is indicated when the myomatous uterus is still small enough to pass easily through a vaginal-section opening, and there are no higher complications requiring abdominal section. The definite classification of cases with regard to the employment of the vaginal operation is considered under "selection of operative method."

The technique of vaginal hysterectomy will be taken up as follows:

Regular steps:

1. Exposure and disinfection of the operative field.
2. Incision of the vaginal wall.
3. Separation of the bladder.
4. Opening the posterior culdesac.
5. Dividing the tissues beside the cervix uteri.
6. Bringing down the fundus uteri.
7. Dividing the tissues beside the corpus.
8. Using the pedicles to fasten up the vagina.

Variations in technique:

Removal of adnexa.
Ligation entirely from above downward.
Preliminary enucleation of fibroid nodules.
Bisection of the uterus.
Paravaginal incision.
Clamp operation.

Regular steps. *1. Exposure and disinfection of the operative field.* The use of iodine simplifies the preparation for operation. After the external preparation (see vaginal operations, Chapter XVII) the interior of the vagina is swabbed freely with the diluted tincture of iodine (one-third strength). The retractors are introduced and the iodine solution is worked into every irregularity of the vaginal vault and surface of the cervix. If there is an infective or suspicious discharge from the uterus, a gauze strip soaked in the iodine solution is packed into the cavity as indicated in Fig. 455,A. The cervix may then be

closed by sutures, as shown in Fig. 455,A and B, or by clamping it with a strong cervix forceps, as shown in Fig. 455,C and in Fig. 456. If sutures are used to close the cervix, it is well to leave them long, to be used for traction. If preferred, injection of the iodine solution into the uterine cavity, as suggested by Stone, may be employed instead of the iodine-soaked gauze.

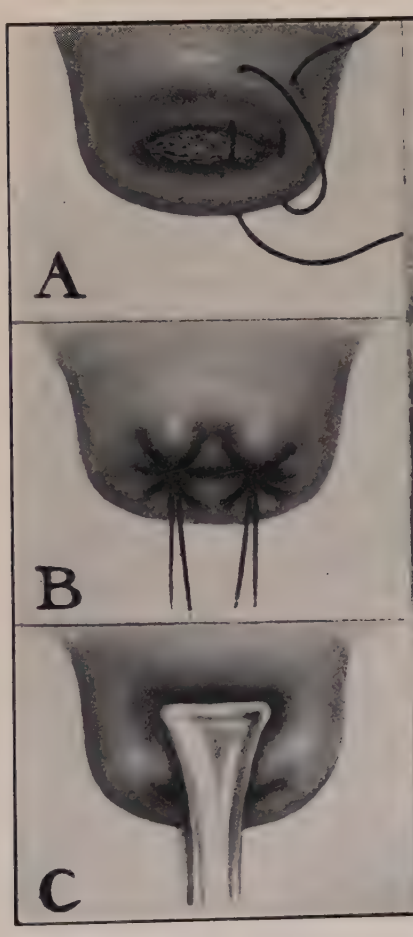


Fig. 455.

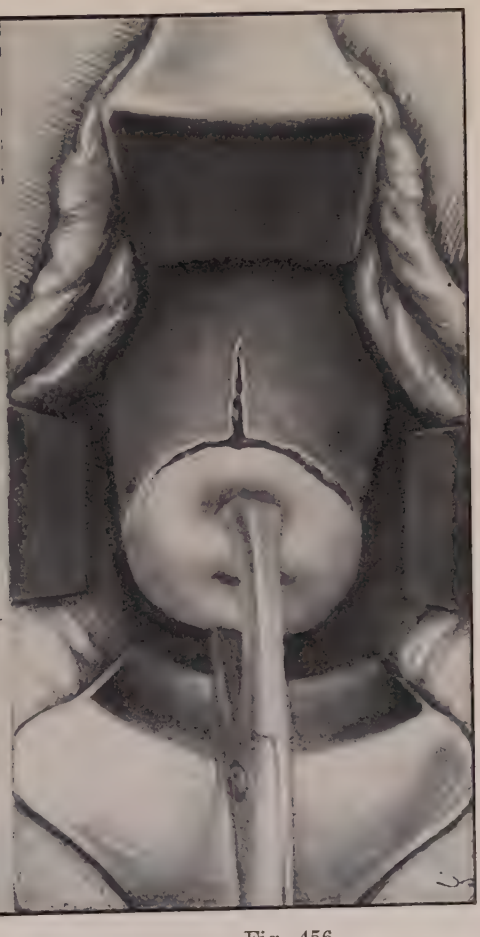


Fig. 456.

Fig. 455. Vaginal Hysterectomy. Preparing the Cervix.

A. The cavity of the uterus has been packed with a strip of gauze wrung out of iodine solution or picric solution. The cervix may then be closed by strong sutures, one of which is here shown in place and ready to be tied.

B. The cervix closed by strong sutures, which are left long for traction.

C. The cervix closed by a heavy forceps, such as shown in Fig. 810,q. This is preferable where the cervix can thus be satisfactorily closed, for the forceps can be more quickly applied than the suture.

Fig. 456. The incisions for beginning the operation. A circular incision is made about the cervix and a longitudinal incision is made from the circular incision forward along the anterior vaginal wall, about half way to the vaginal opening.

2. Incision of the vaginal wall. In addition to going around the cervix, the incision should extend along the anterior vaginal wall (Fig. 456) far enough to give plenty of room for all the necessary work. An incision half-way along the anterior wall gives a sufficient opening in an ordinary case. If there are con-

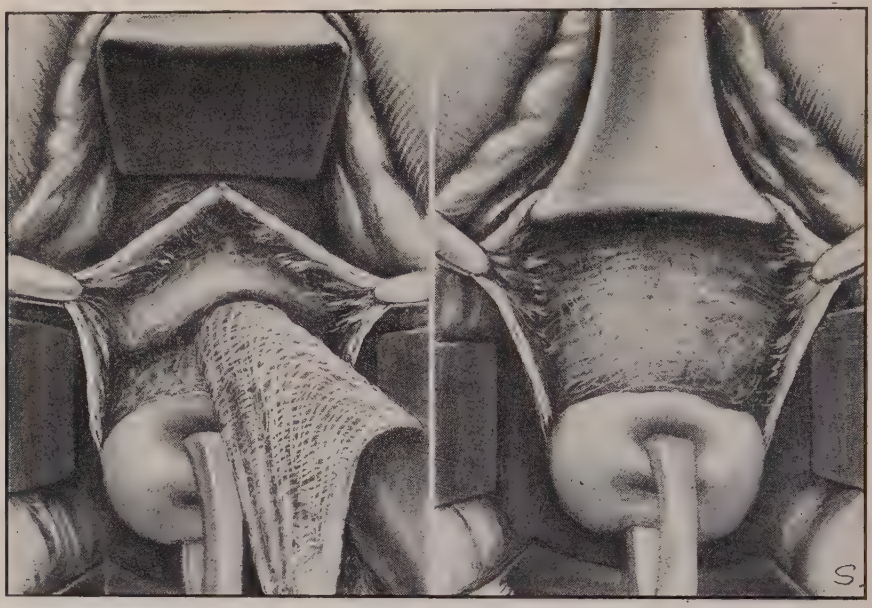


Fig. 457. Fig. 458.

Fig. 457. Separating the bladder from the uterus by the gauze-covered finger.
Fig. 458. The bladder separated and held up out of the way by a retractor.

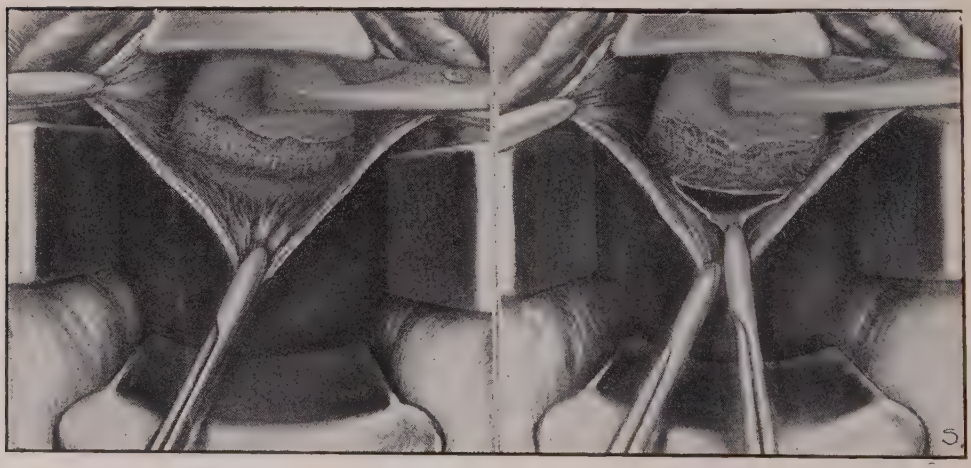


Fig. 459. Fig. 460.

Fig. 459. Separating the vaginal wall from the cervix posteriorly.
Fig. 460. The posterior peritoneal culdesac (culdesac of Douglas) opened.

ditions requiring more room, the incision may be extended still farther forward. Also, in cases with associated cystocele, it may be necessary to extend the incision for correction of the cystocele (Figs. 302 to 306).

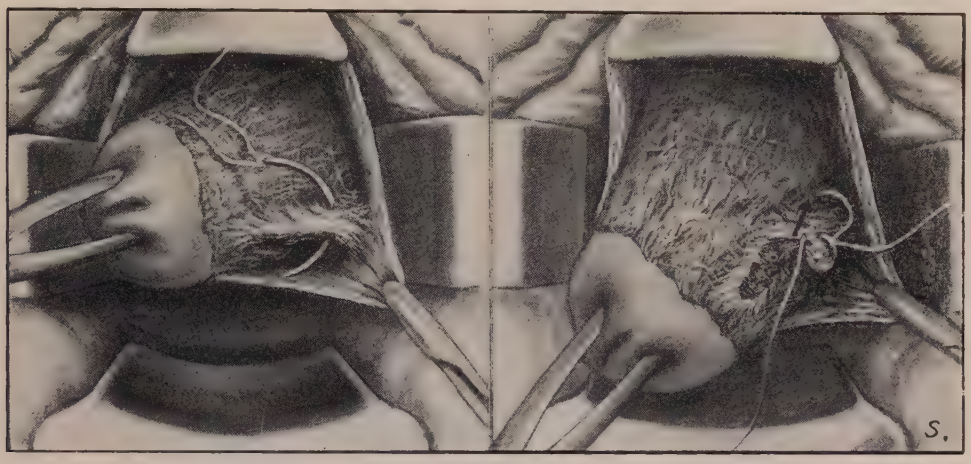


Fig. 461. Fig. 462.

Fig. 461. Beginning the ligation of the vascular tissue on the left side of the cervix.

Fig. 462. The first ligature tied and the included tissue divided, and the second ligature in place ready for tying. The arrow indicates the line of division.

Fig. 463. Fig. 464.

Fig. 463. Ligating and dividing the vascular tissue on the right side. Two portions have been ligated and divided and the ligature for a third portion is in place.

Fig. 464. The vascular tissue ligated and divided on each side of the cervix, up to and including the uterine vessels. A tenaculum-forceps is in place for beginning the maneuver of bringing down the fundus uteri. The maneuver is executed by placing one forceps above another as more and more of the corpus uteri is brought down as indicated in Figs. 125 to 128.

3. Separation of the bladder. By gauze dissection, the bladder is raised from the uterus (Fig. 457) and from the lower portion of the broad ligament on each side. When the bladder has been separated in the median line, it is held out of the way by a retractor (Fig. 458), to facilitate the lateral separation. If it is desired to make direct examination of the uterus before deciding on hysterectomy, the vesico-uterine peritoneal pouch is opened and the uterus examined by palpation. But if the indications for hysterectomy are perfectly clear, the opening of the uterine peritoneal pouch may be delayed until most of the tissue beside the cervix has been divided. Then the anterior pouch is opened and the fundus uteri brought down, as described later.

4. Opening the posterior culdesac. After the bladder has been separated to a greater or less extent, the vaginal incision is extended posteriorly around the cervix (Fig. 459) and the posterior peritoneal culdesac is opened (Fig. 460).

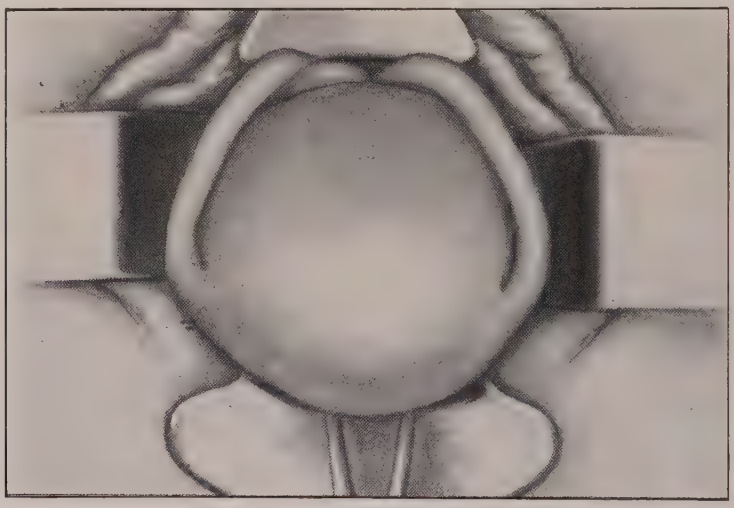


Fig. 465. The fundus uteri brought down and out.

If the culdesac comes low, it may be opened before the ligation of the lateral tissues is begun. In fact, some prefer to begin the operation by posterior incision and opening of the culdesac.

5. Dividing the tissues lateral to the cervix. By lateral pressure, behind and in front, the cervix is freed, except for the vascular tissue at each side. Under the guidance of the fingers, this vascular tissue is ligated and divided, a portion at a time, as indicated in Figs. 461, 462 and 463. Where there is plenty of room, the ligatures may be passed with a curved round-pointed needle, as in Fig. 461. This has the advantage that several portions may be ligated, one after another, without cutting the thread, as indicated in Figs. 462 and 463. When the ligatures are thus connected there is less danger of them slipping off the short pedicles. Some prefer to use the regular long-handled pedicle-needle for passing the ligatures, and in certain conditions where there is scanty space for work,

the pedicle-needle is essential. As a rule, the ligature is passed fairly close to the margin of the uterus and is then pushed well outward before tying, so as to leave a safe margin of pedicle-end distal to the ligature.

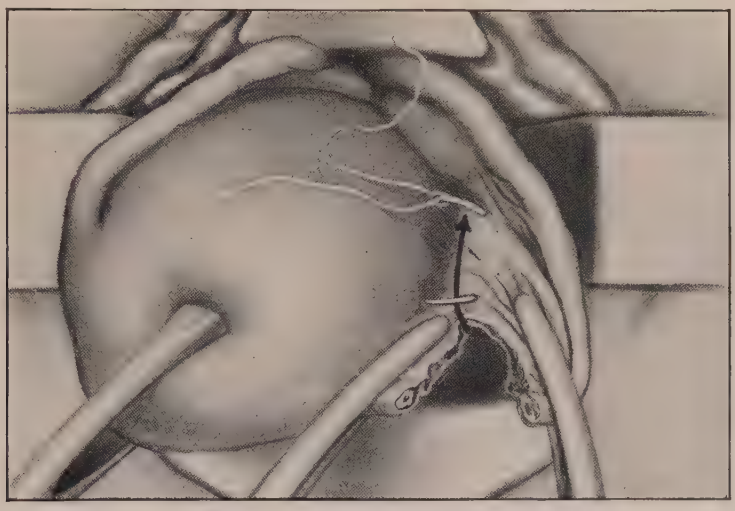


Fig. 466. The upper part of the left broad ligament clamped and divided, and the ligature for the lower portion being passed. The arrow indicates the line of division.

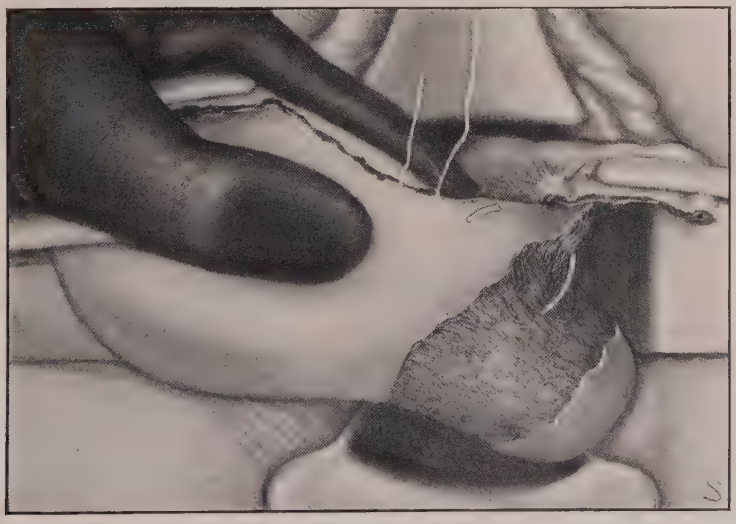


Fig. 467. Ligating the last undivided portion of vascular tissue on the left side. This is where the area ligated from the fundus downward meets the area ligated from the cervix upward.

As a portion of the tissue on each side is ligated, it is cut. This permits the uterus to come somewhat lower under the steady traction. The division of ligated tissue is kept up, a step at a time, until the cervix is freed on both sides (Figs.

462, 463 and 464. When the division of tissue has advanced well up the cervix, the anterior peritoneal pouch is opened, if not already opened, and the opening is extended far laterally with the fingers. This wide lateral separation pushes

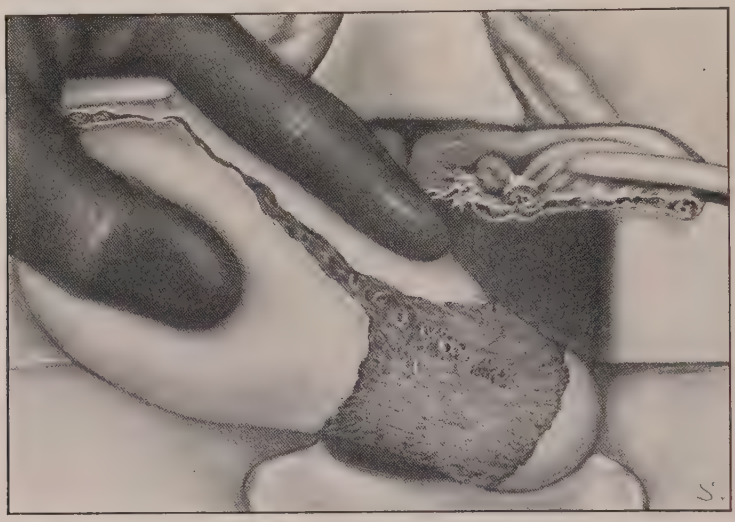


Fig. 468. The left side of the uterus entirely freed.

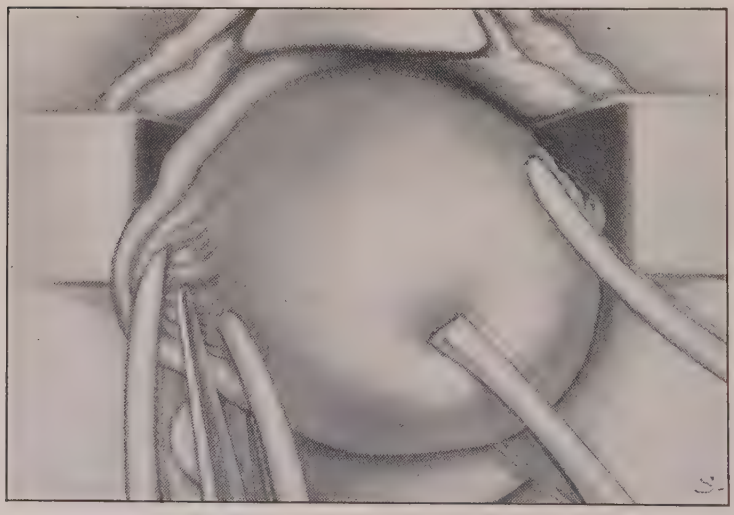


Fig. 469. Beginning the division of the vascular tissue on the right side of the fundus uteri.

the bladder and the ureters away from the immediate vicinity of the ligation area. Under the guidance of one or two fingers in the peritoneal cavity, the lateral ligation and division of tissue is extended up so as to include the uterine vessels.

6. Bringing down the fundus uteri. It was formerly the custom to continue the ligation and division of tissue straight up each side, as the uterus was drawn down farther and farther, until the uterus was freed and removed. As the ligation advanced by this method it became increasingly difficult as the higher pedicles were reached. Not only were the tissues more deeply placed, but as the large corpus uteri was gradually drawn down, it filled the pelvic cavity and left little working room for the fingers and instruments.

This part of the operation has been made much easier by the expedient of bringing the fundus down and out before ligation of the upper pedicles. When the ligation has been extended from below up above the uterine vessels, then the peritoneal surface of the corpus uteri is grasped with a tenaculum-forceps (Fig. 464) and drawn down some. Then another forceps is placed higher and drawn down, and so on until the fundus has been drawn down and out, the cer-

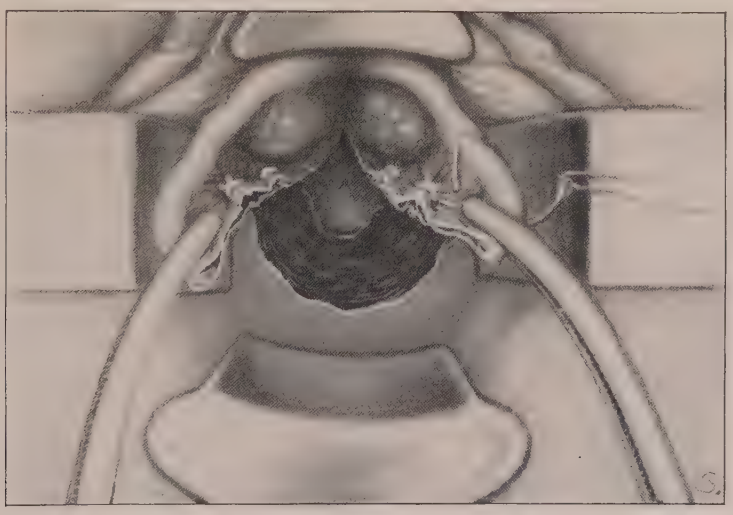


Fig. 470. The uterus removed and the adnexa brought into view. Beginning the ligation of the clamped pedicle on the left side.

vix in the meantime being pushed back in the pelvis. This method of bringing down the fundus by forceps, applied one above another, is illustrated in Figs. 125, 126 and 127. When the fundus has been brought outside (Fig. 465), a gauze pad, with a tape attached, is introduced into the peritoneal cavity to push the intestines out of the lower part of the pelvis, the tape being fastened. Elevation of the pelvis is also a most efficient aid in keeping the intestines out of the way.

7. Dividing the tissues beside the corpus uteri. The Fallopian tube, round ligaments and adjacent vessels are divided between forceps (Fig. 466) and then the remaining portions of the broad ligament are ligated from above downward along the line indicated by the arrow in Fig. 466. The ligation may be carried out by means of the suture-ligature, already mentioned, or by means of separate

ligatures passed with a pedicle-needle. The last ligature, where the division from above meets the division from below, is shown on the left side in Fig. 467. In Fig. 468, the left side of the uterus has been completely freed. The broad ligament of the right side is divided in the same way (Fig. 469) and the uterus removed (Fig. 470). Of course, there are minor variations in technique, preferred by various operators or indicated by special conditions. Sometimes it is more convenient to use forceps for the pedicles all the way down until the uterus is removed, the ligatures being placed later. This saves time and annoyance when the corpus uteri is large and obstructs the opening. On the other hand, some prefer to use ligatures primarily all the way. One advantage of using forceps on the upper portion of the broad ligament is that, if it is found later that removal of the tube and ovary is advisable, that procedure may be carried out with but little disturbance of ligatures.

The adnexa are examined by inspection and palpation. If it is decided to preserve them, the tissues in the grasp of the forceps on each side (tube, round ligament and vessels) are ligated (Fig. 470) and the forceps removed.

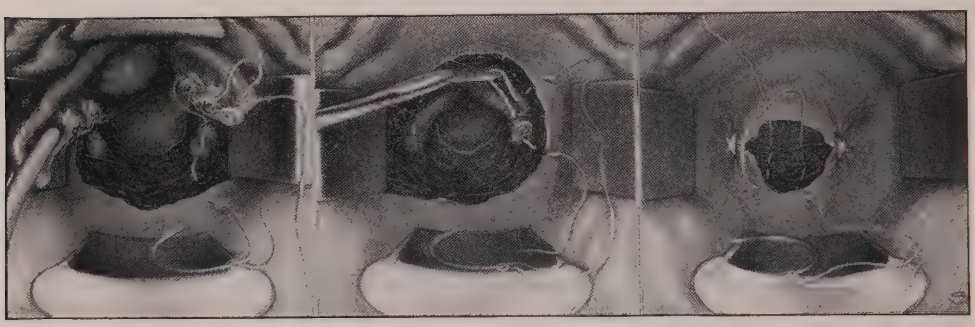


Fig. 471. Fig. 472. Fig. 473.

Fig. 471. Fastening the left adnexal pedicles to the deeper pedicles and to the vaginal wall. The suture-ligature has been used to catch up the various deep pedicles and the posterior vaginal wall.

Fig. 472. The vesical peritoneum and the anterior vaginal wall is then caught with a suture, using for this purpose the other end of the same suture (as here shown) or another suture, as preferred.

The other side is to be treated in the same way and the sutures tied.

Fig. 473. Catching the vascular tissue at the posterior vaginal vault. The suture passes twice through the posterior peritoneal layer and the posterior vaginal wall and also catches up securely the vascular tissue lying between. This small point is an important one in the technique, for in some cases in which it was neglected serious post-operative oozing took place from this vascular area.

8. Using the pedicles to fasten up the vagina. In some cases troublesome shortening of the vagina has followed hysterectomy, because the top of the vagina was left loose and allowed to retract towards the outlet. The reparative infiltration and scar-tissue, of course, fixed the vagina permanently in this retracted condition. To avoid this retraction and shortening of the vagina, the upper end should be attached securely to the broad-ligament pedicles.

The broad-ligament pedicles are caught with a suture-ligature, which is then passed through the deep uterine pedicles and out through the posterior vaginal wall, as shown on the left side in Fig. 471. Another suture, or the other end of the same suture, is passed through the vesical peritoneum, and out through the anterior vaginal wall, as shown in Fig. 472. The other side is treated in the same

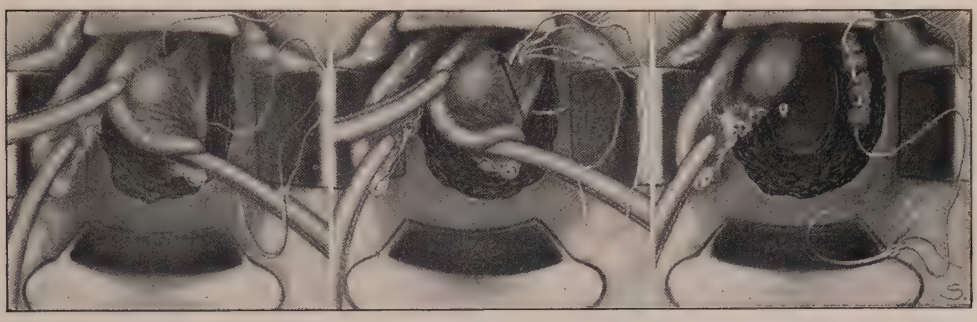


Fig. 474. Fig. 475. Fig. 476.

Fig. 474. Removing the Adnexa. The left tube and ovary have been pulled down until the vascular pedicle is accessible and the first ligature has been passed.

Fig. 475. The first ligature has been tied and the second ligature is being passed. The arrow indicates the line of division.

Fig. 476. The left adnexa have been removed and the pedicles are caught with a ligature by which they will be fastened to the vaginal wall.

The right adnexa are to be removed in the same way and then the vaginal vault is to be fastened to the pedicles and closed as previously described.

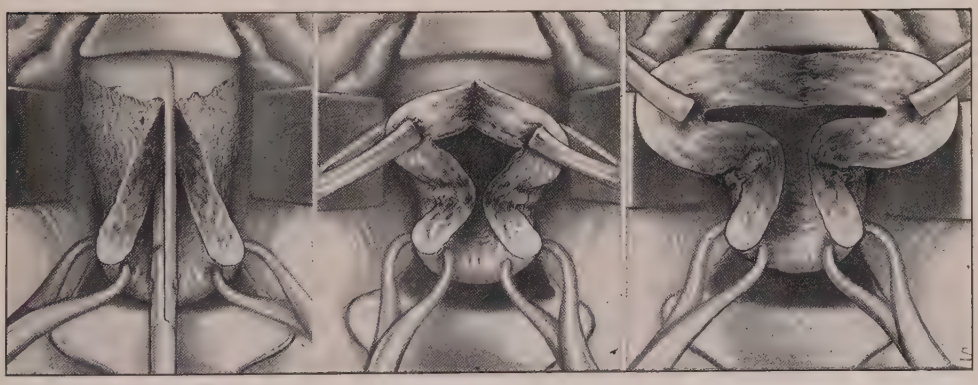


Fig. 477. Fig. 478. Fig. 479.

Fig. 477. Bisection of the Uterus. Dividing the anterior wall of the uterus.

Fig. 478. The incision being extended to the fundus, as the uterus is drawn down more and more, by means of tenaculum-forceps which grasp the cut edges.

Fig. 479. The division extended up over the fundus and down the posterior wall.

way. When these sutures are tied, they fasten the top of the vagina to the deep pelvic pedicles and also aid in closing the vaginal vault. Before or after the tying of these lateral sutures, the raw tissue in front of the rectum should

be caught up in a suture (Fig. 473) to check any oozing there. Neglect of this precaution has resulted in serious post-operative hemorrhage. This suture includes also the culdesac peritoneum and the posterior vaginal wall as indicated in Fig. 473.

The vaginal vault may be closed entirely by sutures, or it may be partly closed and a drain left in, as preferred. The gauze pad holding back the intestines is of course removed before the opening is too much narrowed.

Variations in technique. The following variations in technique are sufficiently important to merit separate mention.

Removal of adnexa. If the tube and ovary are to be removed, they are drawn down, the adhesions separated, the restraining broad ligament stretched and ligated, as indicated on the left side in Figs. 474 and 475. The structures are then excised along the line marked by the arrow in Fig. 475. The short pedicle is caught with a suture (Fig. 476), which later is used to fasten up the vaginal

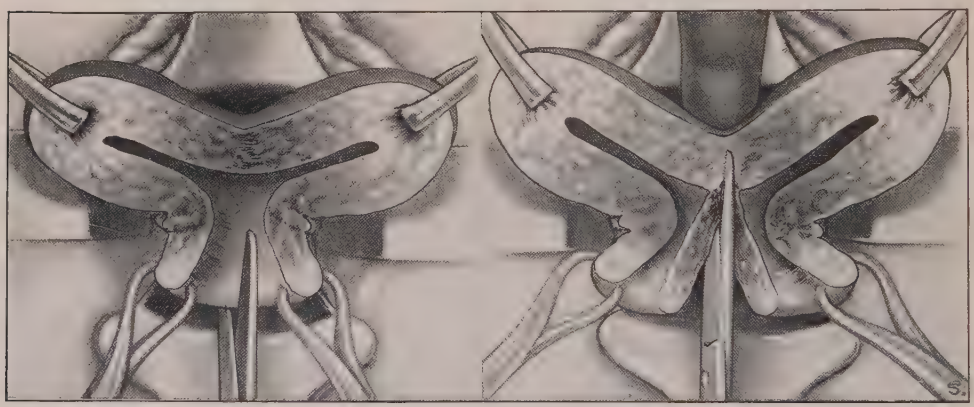


Fig. 480. Fig. 481.

Fig. 480. The division extended still further down the posterior wall.
Fig. 481. Completing the division of the posterior wall.

wall. The adnexa on the other side are removed or not, as indicated, and the vaginal vault is closed as previously described, with or without drainage.

Ligation entirely from above downward. Some operators prefer, in certain cases, to postpone all ligating until the fundus uteri has been turned out, and then ligate entirely from above downward. The uterus is gradually drawn out, fundus first, as more and more of the broad ligament of each side is divided. The tissues, low on the cervix, are the last to be ligated and divided. The posterior culdesac may be opened near the beginning of the operation or left until the end, as preferred. This modification of the technique of vaginal hysterectomy is applicable principally in cases of marked prolapse of the uterus, as considerable relaxation of the broad ligament is necessary for its satisfactory execution.

Preliminary enucleation of myoma nodules. This is a most useful expedient for securing needed room when removing a myomatous uterus. When the

hysterectomy has advanced to the stage for bringing down the fundus, this maneuver may be blocked by the tumor. If the tumor is accessible from the front, it may be incised and removed by nodules or piecemeal. There is usually little bleeding if the incisions are kept near the median line and traction on the incised tissue is maintained. Of course all incised structures must be kept within reach, and if bleeding, or if thought likely to bleed, must be clamped temporarily.

A judicious use of this expedient will often make possible the rapid removal of a mass which otherwise could not have been removed per vaginam.

Bisection of the uterus. In certain cases in which vaginal hysterectomy is attempted, the uterus chokes the pelvic outlet—because of its size or because of adhesions or infiltration which prevent the fundus being brought out. In such a case, bisection of the uterus is very useful. The anterior wall of the uterus is

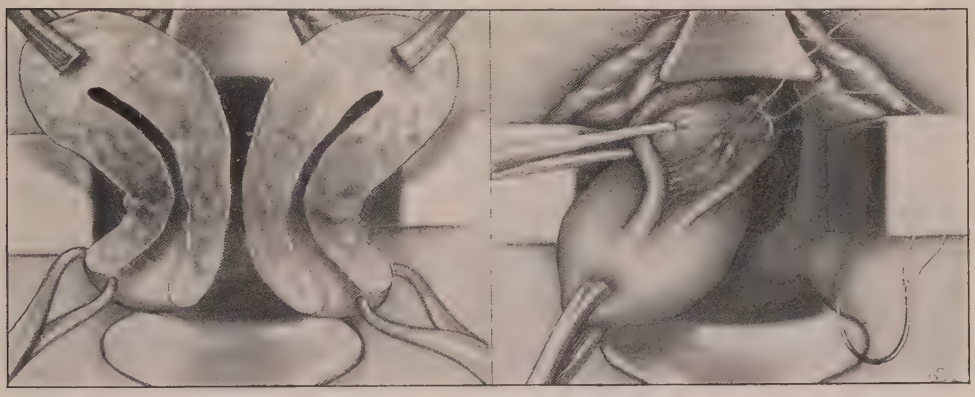


Fig. 482. Fig. 483.

Fig. 482. The uterus bisected. The exposed mucosa and adjacent surfaces are sterilized with iodine solution, and then one-half of the uterus is pushed up into the pelvis to give more room for the excision of the other half.

Fig. 483. The right half of the bisected uterus has been pushed up into the pelvic cavity, and the first ligature has been placed for the excision of the other half. The adnexa, also, are to be removed.

The subsequent steps are the same as shown in Figs. 474 to 476.

divided in the median line, as shown in Figs. 477 and 478. The division is continued up over the fundus and down the posterior wall, as shown in Figs. 479 and 480. Under the guidance of the finger, which insures protection to any intestinal coil or other structure behind, the remaining part of the posterior uterine wall is divided (Figs. 481 and 482). The cavity in each half of the uterus is again disinfected with iodine (one-third strength of the tincture) along with the cut surface, and one of the halves is pushed back in the pelvis. With the additional room thus secured, the other broad ligament is easily ligated (Fig. 483) or clamped. When the half of the uterus is removed from the side first ligated, the other half is brought down and removed in the same manner. The adnexa may be left or removed as preferred.

Bisection of the uterus is applicable in chronic inflammatory and nutritive diseases as well as in fibromyomata. It is not applicable, however, in carcinoma, except as an emergency measure to complete an otherwise impossible vaginal hysterectomy, begun by way of the vagina through lack of judgment or because the condition of the patient contraindicated abdominal section.

Paravaginal incision. When the vaginal opening is so small as to seriously interfere with the work, it may be enlarged as needed, by Schuchardt's paravaginal incision. This is rarely necessary, however, for myoma or other nonmalignant conditions. It is employed principally in the radical vaginal operation for cancer of the cervix uteri, and is illustrated in the next chapter.

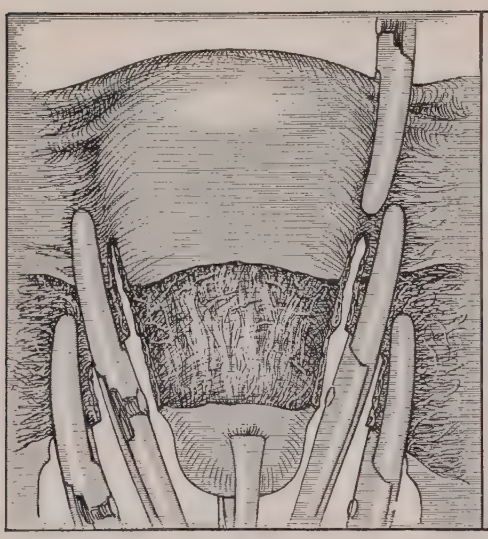


Fig. 484.

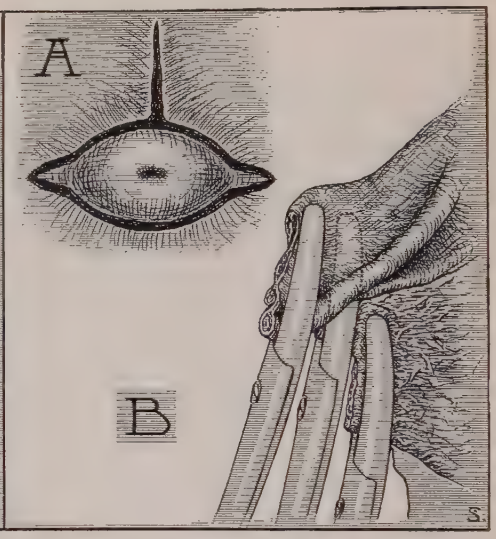


Fig. 485.

Fig. 484. Vaginal Hysterectomy by the Clamp Method. Showing how the lower clamps are applied one above another close to the uterus. For applying the upper clamps the corpus uteri is brought down as previously described (Figs. 464, 465 and 466). One or more upper clamps may be required on each side.

On each side the tip of the last upper clamp should extend past the tip of the last lower clamp, as indicated in the illustration, so as to insure that no vascular tissue remains unclamped.

Fig. 485. *A.* Excising a small angle of vaginal wall at the side of the cervix to prevent the vaginal wall being caught in the lower clamp. Clamping the vaginal wall causes unnecessary pain as long as the clamps are on.

B. Showing the relation of the clamps after excision of the uterus. The upper portion of the broad ligament overlaps the portion beneath.

Clamp operation. In cases where the patient is in poor condition from chronic blood-loss or other reason, and rapid operation is essential, the time required for the removal of the uterus may be shortened by the use of clamps instead of ligatures. The steps of the operation are the same as already described, except that the broad ligament of each side is caught with two or three

clamps, as indicated in Fig. 484. The clamps are left on for about forty-eight hours, when the crushed vessels are sufficiently closed for their removal.

In making the vaginal incision for the clamp operation, it is well to incise the vaginal wall well out to each side, as shown in Fig. 485,A, so that the lower clamps may take a good bite of tissue without including the vaginal wall. If the vaginal wall is included in the bite of the clamp, there is likely to be more post-operative pain and, also, the vaginal wall is so fixed by the clamps that the subsequent exposure and clamping of higher tissues is somewhat interfered with. For some time the author purposely included a strip of vaginal wall in the lower clamps, to secure better fixation of the vaginal wall to the pelvic pedicles, but this seemed to cause pain and so was discontinued.

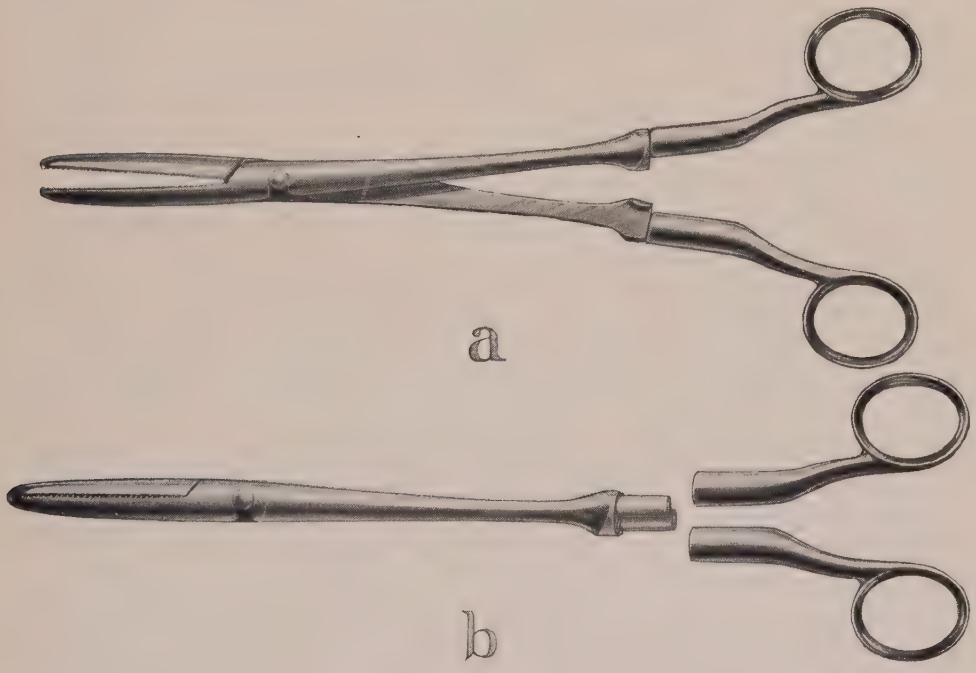


Fig. 486. Pryor's Hysterectomy Clamps. *a*. A clamp complete and ready for application. *b*. A clamp closed and the handles removed.

An important point in this operation is to secure a large portion of the broad ligament in each clamp, so that all the ligament of each side may be included in two or three clamps. Of course, additional clamps or ordinary pressure forceps may be used if necessary, but four to six clamps occupy a good deal of space in the vagina, and a greater number than that choke it and interfere with the work. The secret in the use of few clamps, is to isolate the uterus thoroughly, anteriorly and posteriorly, reduce the broad-ligament tissue to be clamped to as small a mass as possible, without stirring up hemorrhage, and loosen adhesions about uterus and adnexa, so that the broad ligament may be stretched before clamping. Then one or two clamps, as necessary to extend above the uterine

vessels, are applied on each side from below, as shown in Fig. 484. The fundus uteri is then turned out and a clamp applied on each side from above, as indicated on the left side in Fig. 484. Notice that the points of the upper clamp and the preceding one on each side overlap slightly, so that no vessel may escape. When the clamps are all in place and lying beside each other, the upper portion of the broad ligament of each side overlaps the middle portion, as shown in Fig. 485.

The operation is completed by one or two sutures on each side, which fasten the vaginal wall to the pelvic pedicles and catch up oozing tissue in front of the rectum and narrow the vaginal opening so as to prevent hernia. In the vaginal operation, it is intended that the tissue within the grasp of each clamp shall slough, hence this portion of each pedicle should be drawn down so that it lies within the vagina or so that it is at least extraperitoneal. To accomplish this, the clamps with attached pedicles are drawn down and the vaginal wall is drawn up around them by the sutures above mentioned. If the pedicles have been well isolated and stretched before the clamps were applied, it is usually possible to sew the vaginal wall up around the points of the clamps, so that when the operation is completed, the clamps lie wholly within the vagina. It is well to suture the vaginal wall securely to each pedicle, so that the latter will not retract to a serious extent when the clamps are removed. The vaginal vault is filled with a firm packing, to prevent the forcing out of a coil of intestine by the strain of coughing or vomiting. Also, gauze should be disposed carefully between and around the clamps all the way to the outside, so that the metal nowhere lies in contact with the vaginal wall. Prolonged contact with the metal causes irritation of the vaginal wall. In a very urgent case, the suturing may be omitted, and the vaginal vault packed with gauze, the packing being so dispersed as to hold the vaginal wall up around the pedicles and also plug the opening securely.

It is of course important that the clamps be locked securely so that they cannot become loose. If there is any question as to the security, the handles of each clamp may be tied together, though that is hardly necessary unless the catch is defective. The handles of the ordinary clamps are much in the way in the after-care of a patient. Pryor's clamps, which have removable handles (Fig. 486), are the most convenient for vaginal hysterectomy.

In forty-eight hours the clamps are removed without disturbing the gauze. The gauze packing is removed on the fifth day, unless the necessity for drainage requires its earlier removal.

Bisection of the uterus is sometimes very helpful in facilitating access to the broad ligaments. Bisection of the uterus and the subsequent use of clamps on the broad ligaments, is the method so well developed by Pryor for the treatment of chronic pelvic inflammation requiring hysterectomy. An important point in the technique is to stretch the broad ligament before clamping, by loosening adhesions and pulling the half uterus as low as possible, and also the adnexa if the adnexa are to be removed, and they usually are when chronically inflamed.

Pryor depended on accurate packing of the vaginal vault to hold the vaginal wall about the pedicle and to close the opening in the vagina. If using iodoform gauze, the iodoform should be washed out (washed iodoform gauze) to avoid iodoform poisoning. This extensive gauze packing is left in place until healing is well advanced, about five days, and is then removed gradually to permit the opening to contract about it.

Vaginal Myomectomy.

This may be a simple operation or a severe one, depending principally on the location of the growth. The cases may be grouped into classes as follows:

Submucous pediculated myoma, projecting from cervix.
Intramural myoma in cervix.
Submucous myoma high in uterus.
Subperitoneal myoma.

Submucous pediculated myoma projecting from cervix. This may give rise to severe and persistent bleeding, which is, as a rule, the most serious feature. The usual condition is that a rounded, bleeding, partially sloughing mass is lying in the vagina, as shown in Fig. 487. The patient is often so exsanguinated that the smallest operative measure becomes a serious matter.

If the pedicle can be reached and clamped, as shown in Fig. 488, that causes the patient but little disturbance and is the safest plan. The pedicle is then divided below the clamp with a curved scissors, as indicated in Fig. 488, and the mass removed. Gauze is then packed in the vagina around the clamp (Fig. 489), which is left in place twenty-four to forty-eight hours, depending on the size of the pedicle. The clamp is then removed but the gauze is left a day or two longer (Fig. 490). If there is no bleeding, the gauze is then removed and antiseptic vaginal douches given until the discharge disappears. This method of removal of course requires no anesthesia.

In dealing with pediculated submucous fibroids, it must be kept in mind that they are sometimes accompanied by more or less inversion of the uterine wall, as shown in Fig. 491. When traction is made on the tumor in the process of clamping the pedicle, the uterine inversion may be much increased. In such a condition a cut made across the pedicle may open the peritoneal cavity, as indicated by the dotted line in Fig. 492. This serious accident may be avoided (a) by making a careful examination to find a partial inversion if present, and (b) by clamping and dividing the pedicle close to the tumor rather than far away from it.

Intramural myoma in cervix. Before subjecting a patient to operation for a cervical myoma, myomata higher in the uterus should be excluded with reasonable certainty. Myoma of the cervix alone are found in only about five per cent of myoma cases. The tumor may be situated in any part of the cervix.

The first step in the operation is incision of the vaginal wall overlying the mass. If the growth is situated in the anterior portion of the cervix, as in

Fig. 493, the bladder must be lifted out of the way. To accomplish this, the vaginal incision is extended along the anterior wall, as shown in Fig. 494. The vaginal flaps are separated from the bladder and then the bladder is separated from the uterus, as indicated in Fig. 495. The bladder is then held up with a

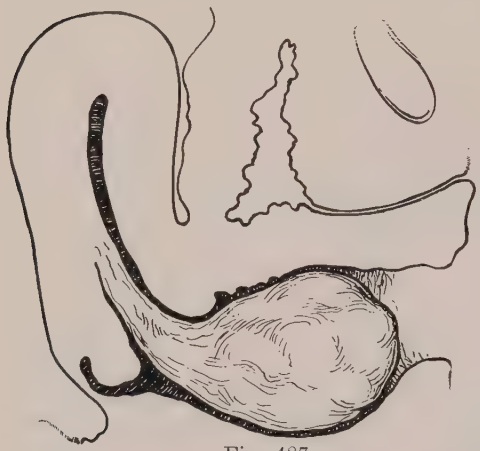


Fig. 487.

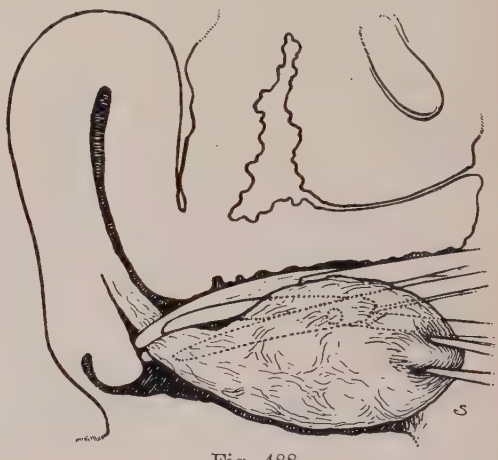


Fig. 488.

Fig. 487. Vaginal Myomectomy for a Pediculated Fibroid. Showing the tumor extruded into the vagina and the long pedicle extending to the uterine interior.

Fig. 488. The pedicle clamped and the scissors in place for dividing the pedicle.

Fig. 489.

Fig. 490.

Fig. 489. The tumor removed and the clamp and gauze packing in place. The clamp is to be left in place twenty-four to forty-eight hours, depending on the vascularity of the pedicle.

Fig. 490. The clamp removed and the pedicle retracted.

retractor, exposing the capsule of the tumor, which is incised (Fig. 496). This incision in the uterine tissue over the tumor is enlarged and spread apart and the tumor grasped (Fig. 497). By traction and blunt dissection, with perhaps some

clipping with scissors here and there, the tumor is enucleated. The bed of the tumor is then closed with sutures (Fig. 498) sufficiently to check oozing. The bladder is then allowed to drop back in place and the vaginal wound is closed, with or without drainage as preferred.

Fig. 491.

Fig. 492.

Fig. 491. Showing a partial inversion of the uterus, caused by the dragging of the pediculated fibroid.

Fig. 492. Showing one of the dangers of myomectomy in such a case. If the tumor is pulled down strongly and the clamp placed as high as possible, the line of division may open the peritoneal cavity.

Fig. 493.

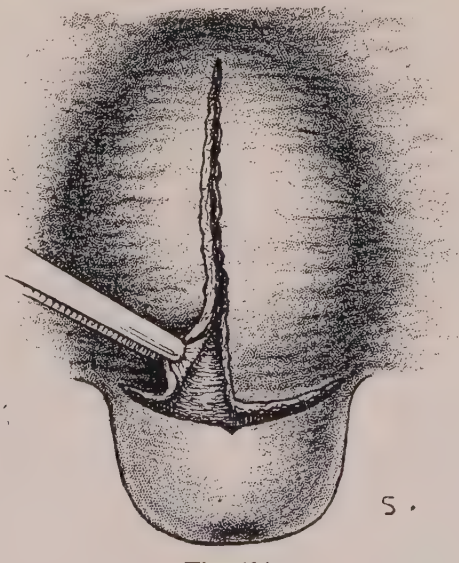


Fig. 494.

Fig. 493. Vaginal Myomectomy for a Sessile Cervix Fibroid. The tumor, showing its relation to the cervix and the uterine wall and the bladder.

Fig. 494. The incision for approaching the large cervix fibroid. The vaginal wall is to be raised from the bladder and the bladder from the uterus.

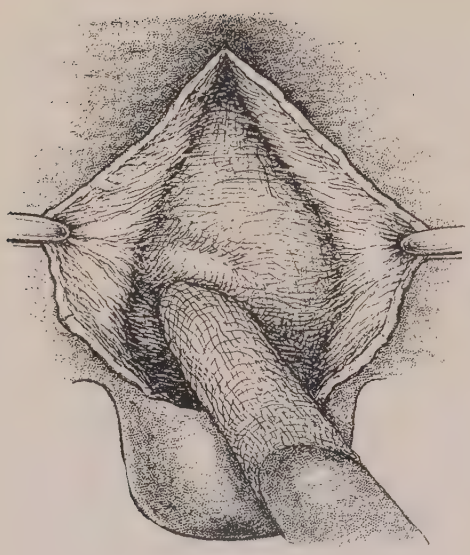


Fig. 495.

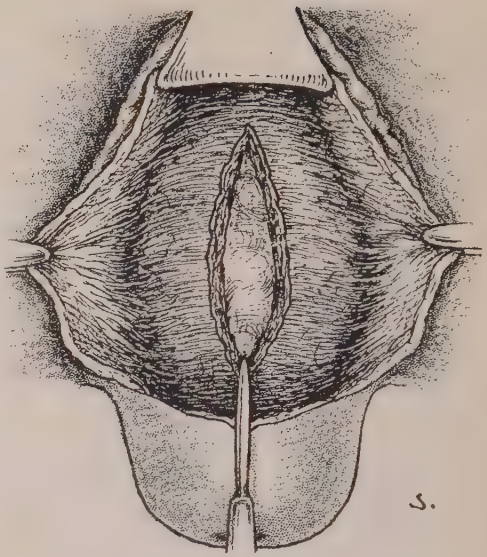


Fig. 496.

Fig. 495. Raising the bladder from the uterus with the gauze-covered finger.

Fig. 496. The bladder has been raised and the portion of uterine wall lying over the tumor is being divided.

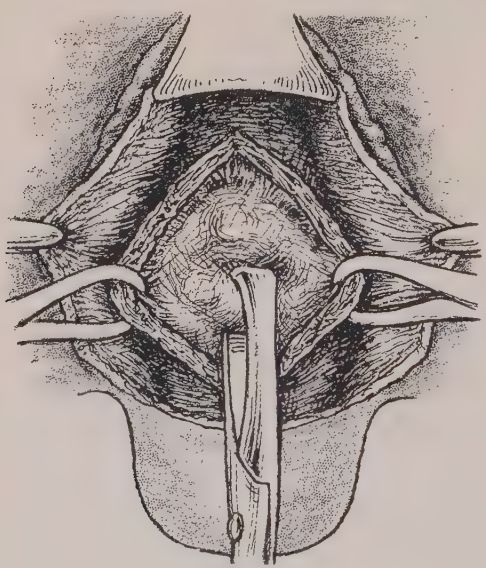


Fig. 497.

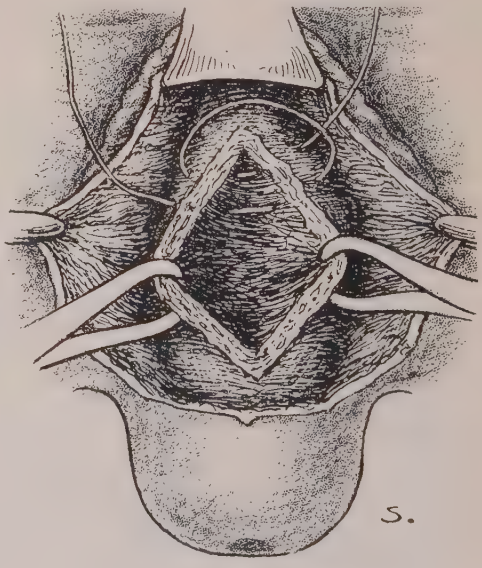


Fig. 498.

Fig. 497. The tumor has been exposed and is being enucleated. The enucleation should be accomplished as far as practicable by blunt dissection, so as to avoid division of the deep tissues that might cause troublesome oozing. Bleeding is controlled first by traction and later by the sutures that close the raw area.

Fig. 498. Closing the raw area in the uterine wall by sutures. These are of catgut and may be interrupted or continuous as preferred.

Submucous myoma high in uterus. This is a more serious condition than the preceding. Opening of the peritoneal cavity may or may not be necessary. A tumor such as indicated in Fig. 499 may be removed without opening the peritoneum, provided that membrane will peel up easily. Unless there is sloughing or infection about the tumor, the opening of the peritoneal cavity does not increase the danger very much, and may be necessary to determine positively whether myomectomy or hysterectomy is preferable.

The first part of the operation is the same as for the preceding form of tumor (see Figs. 494 and 495). When the bladder has been lifted out of danger, the uterine wall is divided up to the tumor, as shown in Fig. 500. The tumor is then shelled out if small or removed in pieces, if large, as shown in Figs. 501 and 502. The uterine wall with the bed of the tumor is then sutured (Fig. 503),

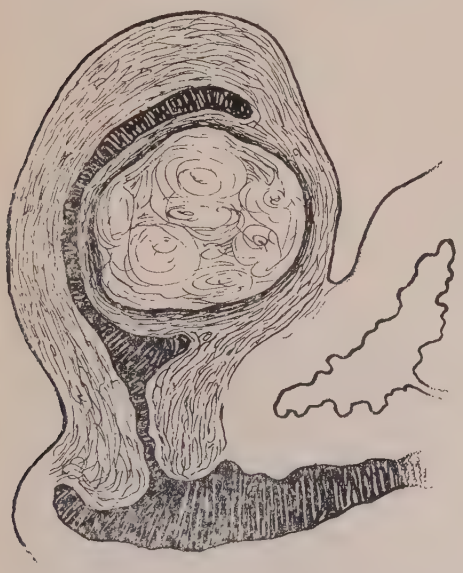


Fig. 499.

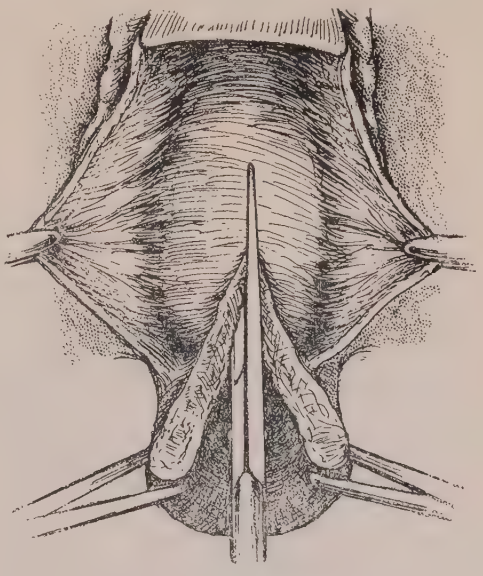


Fig. 500.

Fig. 499. Vaginal Myomectomy for a Sessile Fibroid in the Corpus Uteri. Showing the tumor and its relations.

Fig. 500. The vaginal wall has been separated and the bladder raised and the anterior wall of the cervix and lower part of the uterus are being divided to allow access to the tumor.

the sutures being placed so as to control bleeding. The bladder is then allowed to drop back into place (Fig. 504), the cervix is sutured (Fig. 504) and the vaginal wound closed. Drainage by way of the cervical canal should be provided for, by rubber tubing or by otherwise making certain that the canal is well open.

Subperitoneal myoma. One or more subperitoneal myoma nodules may be removed, by raising the bladder, opening the vesico-uterine peritoneal pouch, bringing the fundus uteri outside and enucleating the tumor much the same way as indicated in Figs. 435 to 441.

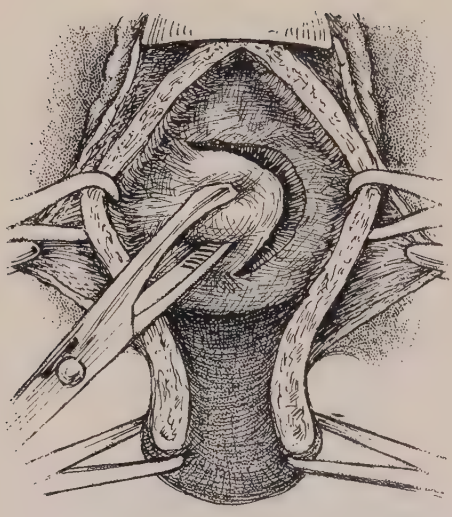


Fig. 501.

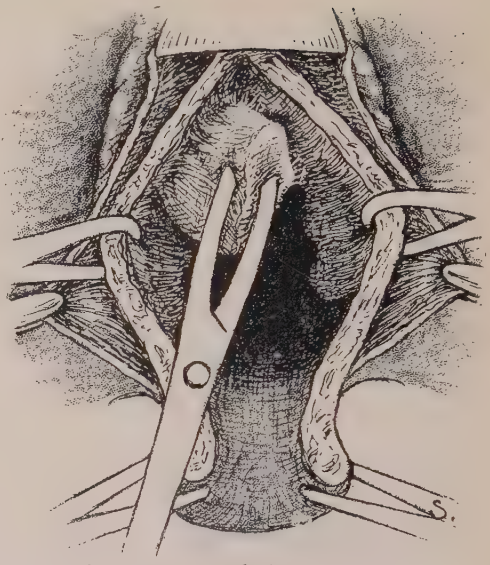


Fig. 502.

Fig. 501. The tumor exposed and its removal by morcellation begun. The bleeding is controlled largely by traction.

Fig. 502. Removing the last piece of tumor.

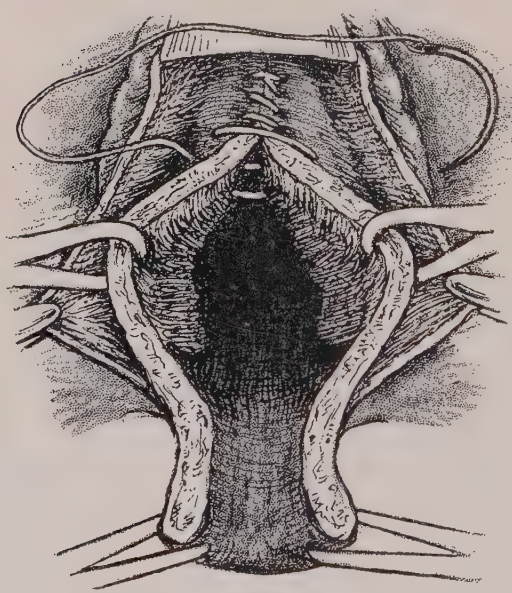


Fig. 503.

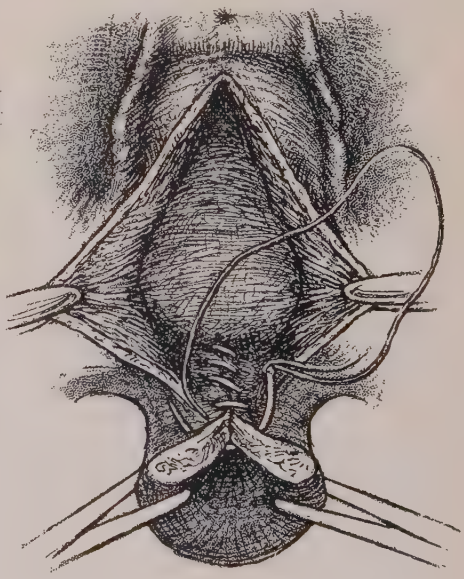


Fig. 504.

Fig. 503. Reuniting the uterine wall. If preferred more than one row of sutures may be used.

Fig. 504. Closing the cervical incision. The higher portion of the uterine wound has been closed and the bladder has been allowed to come back into place.

Vaginal Resection of Corpus Uteri.

Occasionally, it will be found in a case of myoma, after the uterus has been brought down and out, that it is advisable to excise the portion of corpus uteri containing the tumor, leaving the other portion. The resection may take the form of the wedge excision (Figs. 444 to 447) or of the horizontal excision (Figs. 448 to 451).

Vaginal Amputation of Corpus Uteri.

As a rule, when the corpus uteri is removed per vaginam, the cervix is removed also. In a case of myoma, requiring removal of the corpus uteri by way of the vagina, it may be advisable to preserve the cervix to be utilized in the treatment of an associated bladder prolapse. As much of the uterus as thought best is removed by the method indicated in Figs. 148 and 149, and the remaining portion is used as desired.

Palliative Measures

The palliative treatment in cases of myoma is directed principally towards the relief of bleeding and pressure symptoms. The measures employed for this purpose are curettage, radium treatment and x-ray treatment.

Curettage. This may control bleeding temporarily in those cases in which the bleeding is due to hyperplasia of the endometrium. In many cases, however, the cavity is so distorted that the curet can only wound parts of the wall here and there without removing the entire endometrium. In addition to this uncertainty of controlling the hemorrhage, there is danger of infection of the uterine wall or of infection and necrosis of the growth, leading to an exceedingly dangerous condition. Schroeder reports a case of necrosis of a submucous tumor, the capsule of which had been torn by the curet. In a case in which the author had to operate for complete necrosis of a large intramural fibroid, the necrosis was due to injury and infection from a sound introduced by a midwife to produce abortion in the supposedly pregnant uterus.

In carefully selected cases, curettement may be advisable, partially as a diagnostic measure, but there must be a clear understanding of the dangers incident to it and good reason for taking the risk. In the hands of those experienced in the selection of cases and in the use of the curet, the probability of any serious complication from a clean curettement is not great. But there is great risk in careless intrauterine instrumentation in these cases, even in the simple introduction of the uterine sound.

Radium treatment and x-ray treatment. On account of the important technical details in the employment of radium and x-ray, they may be classed under operative measures though the effective article in the manipulations is other than the knife. In the last few years great advance has been made in the application of these measures to uterine myomata. There are certain

classes of cases in which they can be depended on to effectively shrink the growth and relieve all symptoms. The selection of cases for radium therapy and x-ray therapy is taken up below under "Indication for Treatment."

INDICATIONS FOR OPERATIVE TREATMENT.

In what cases is removal of the growth advisable? As a general proposition it may be stated that the growth should be removed when there are troublesome symptoms which persist in spite of the employment of uterine astringents with general tonic and hygienic measures, or in which the conditions are such that these palliative measures are not likely to give relief. In a considerable proportion of the cases the symptoms are so severe and threatening that there is no question as to the advisability and urgency of operation for removal. In the majority of cases, however, the symptoms are not so severe or threatening, and by palliative measures the patient may be made fairly comfortable for a time. In such cases should the tumor be removed or should it be let alone until serious symptoms develop? The facts so far available indicate that in those cases with persistent symptoms, the interests of the patient are best conserved by the radical treatment of the growth while the patient is still in good condition and the risk accordingly small.

In order to present the important phases of the subject, the following facts from a paper by the author some years ago are given. To come quickly to the point, it is well to eliminate those classes of cases about which there is practically no question, which classes are as follows:

1. Cases in which the tumor causes no symptoms. These are seen by the physician only rarely and then usually by accident.

2. Cases in which the tumor is small and is causing only slight symptoms (moderate menorrhagia or dysmenorrhœa) which are relieved by general tonic treatment with the addition of uterine astringents (ergotin, stypticin, hydrastis), and the symptoms do not return soon after the treatment has been discontinued.

3. Cases presenting conditions that threaten life or cause persistent severe suffering.

In the first two classes mentioned, watchful waiting is unquestionably the preferable plan. In the third class the necessity of prompt radical treatment has long been recognized. It is in the cases which lie between these two extremes to which attention is now directed. What should be done for the patients who have no threatening symptoms? They come for advice and a decision must be made as to whether watchful waiting or radical treatment should be employed. In a typical case the tumor is of moderate size and the patient is fairly well nourished. The menstrual flow is somewhat excessive, but by the continuous administration of ergotin or other astringents it can be held down to about normal amount. The backache and pelvic pressure are

troublesome at the menstrual periods, but between periods the patient feels fairly well and is able to do her work and attend to her social duties. She feels tired a good part of the time and has backache and pelvic discomfort on extra exertion.

What advice shall we give such a patient? Should the tumor be let alone or should it be subjected to radical treatment?

It is easy to say to the patient "Wait. There is no special indication for radical treatment just now, there may be no serious increase in the symptoms at any time, and it is possible that after the menopause the troublesome symptoms will largely disappear." The points made in that advice are all literally true and the advice itself seems plausible. But when some complication that would have been prevented by early removal of the tumor, rapidly causes the death of our patient or forces her to operation with quadrupled risk, we begin to doubt the wisdom of the waiting advice. This is not a picture of fancy. Nearly all the myoma cases that were operated on the world over, previous to the last few years, and a large part of those that are operated on today, have passed through the process just mentioned. The patient went to a physician who treated her expectantly, according to the established usage, and congratulated himself that she was getting along pretty well. And she was "getting along pretty well"—"pretty well" toward a condition that greatly increased the risk of the operation which was finally necessary. In many cases the physician who long treated the patient loses the lesson of the case through no fault of his own. Some of these patients pass through many hands in the various stages of the tumor's growth, for it extends through many years. Perhaps half a dozen physicians have, from the same case, been established in their conclusion that myoma patients get along very well and rarely need operation, while only the last physician whom the patient consults has the true lesson of the case forced upon him in a way that cannot be misunderstood. In some cases the serious condition advanced so rapidly or so insidiously that the patient dies without the consideration of operative measures, or is found in such condition that operation is no longer possible. Some physicians find it hard to believe that uterine myomata really cause death except so rarely that the cases may be classed as curiosities. A practical experience with even a moderate number of advanced cases will quickly dispel this illusion, provided the physician watches the cases to their termination. Bishop reports twenty-seven deaths due to myoma without operation.

On the other hand, in deciding what to do for these patients, it is easy to take the short-cut and advise radical measures for all patients with palpable myomata—that is, it is easy for the physician. But before advising radical measures in any case we must assure ourselves that the risk assumed is fully justified by the danger of delay in that particular case. Operative removal necessarily carries the risk incidental to all operative work, while radium treatment and x-ray treatment seriously impair ovarian function, a most important matter in patients under forty years of age.

What advice shall we give our patient? The symptoms at present are not such, in themselves, as to necessitate operation. They are not threatening speedy death, neither are they causing great disability. If they continue as they are, the patient, by continuing under treatment, by lying down most of the menstrual days and by being careful at other times as to extra work and walking, may live a fairly comfortable life. Many women, probably most women in ordinary circumstances, would prefer this state rather than radical measures. And the author is not condemning such a choice, granted the stationary character of the trouble. But have we any well-grounded assurance that the trouble will remain stationary? There lies the gist of the matter. The patient comes to the physician to learn, not what she already knows, viz., that with the present symptoms she can get along in comparative comfort, but she comes to learn whether or not it is *safe* for her to go along in that way. She wants to know whether she had better have the tumor removed now, while she is in good condition and the risk accordingly small, or whether she had better wait and see whether or not severe symptoms develop. This brings us squarely to the question of prognosis in this class of myoma cases.

It is interesting, and pertinent to the subject, to notice for a moment the method of development of surgical treatment in general and of abdomino-pelvic surgery in particular. At first major surgery was invoked in only the most desperate cases, those that were passing to certain and speedy death. This was proper, for, in the state of experience at that time, the operation itself meant death in many cases. It was a desperate remedy for a desperate condition, and occasionally attained success. As the technique was perfected, more of the desperate cases were rescued from death. As these fatal conditions for which operation was carried out, were studied in conjunction with the experience gained in the operative work, physicians began to anticipate the desperate and terminal conditions, and to operate when the patient was in a somewhat better condition, and with much better success.

Then they began to look still further ahead and consider the possibilities of surgery in conditions that became inoperable many months before death. Thus was gradually worked out the prognosis and required treatment for ovarian tumors, for uterine cancer and for other pelvic and abdominal diseases that were found to prove invariably fatal within a few years. The necessity of early operation in these conditions that proved fatal in a comparatively short time, was soon established, and gained general acceptance long ago. The course of such diseases was quickly run. Within the short period of a few years, the physician saw the patient a well woman, then the disease beginning, then its full development and then the invariable death, this series of events taking place so quickly that it was all under the one physician and within his recent recollection. The lesson was obvious—delay meant death.

That field conquered, surgical attention was directed to the question of early operation in those diseases which, though not invariably causing death, never-

theless frequently caused death and in another large proportion of the cases caused persistent suffering and invalidism. Then was worked out the advisability of operation in the quiescent period (before the onset of the threatening or terminal symptoms) in cases of persistent salpingitis, appendicitis, nephrolithiasis, cholelithiasis, and many abdominal and pelvic conditions that run a comparatively rapid course. In the case of a patient with one of these diseases, the prognosis is not necessarily fatal. Many such patients having persistent symptoms have lived to old age. And yet when any one of these conditions is unmistakably present, and there are persistent symptoms from it, there is little question but that removal of the disease is the part of wisdom, not so much because the present symptoms are troublesome but because the symptoms indicate that the process is continuing active—it having been established, and generally accepted, that when any one of these diseases is persistently active, it is liable at any time to develop a condition that may cause the patient's death or make extremely hazardous the operation then necessary.

This is exactly the condition that is present in uterine myoma with persistent symptoms, even though the symptoms are not for the present threatening or disabling. Yet this fact is not generally recognized, and there is a reason for its not being recognized. The actual life-history of myoma patients, of the class under consideration, has not been followed up and completely recorded in a sufficient number of cases to enable us to present positive proof as to what proportion of them die of the disease, what proportion suffer chronic invalidism, and what proportion experience no serious trouble. The finding of fatal complications in a large proportion of the operated cases is not proof positive that the less severe cases will necessarily develop such complications. The principal question concerning these fatal complications is not "What proportion of operated cases present them?" but *"What proportion of the mild cases progress to them?"* The author does not minimize the importance of the arduous work of determining accurately the number of these complications in operated cases. That is needed and is necessary to the determination of the proportion of serious results in all clinical fibroid cases. But in our enthusaism over the accomplishment of the first, we must not mistake it for the second. The proportion of operated cases presenting these fatal and disabling complications is now a matter of record, and the record includes a sufficiently large number of cases to justify fairly definite conclusions on that point. The proportion of mild cases that progress to the serious condition is not a matter of record, in fact, has not been even approximately determined, and cannot be until the life-history of a very large series of the various classes of myoma cases is available for analysis.

Why is it so hard to establish certainly the exact proportion of myoma cases that turn out badly? Because of the slow progress and long duration of the disease. In persistent salpingitis or appendicitis the cases that are going to turn out badly usually do so within one or two or three years, so by watching a large series of cases for that length of time it could be determined what propor-

tion resulted seriously, and could be established by statistical proof just what proportion of cases could be saved from death or disablement by early operation. The myoma cases, on the other hand, present a much more difficult problem. Here the absence of threatening symptoms for five or ten or twenty years, gives no assurance that serious trouble may develop at any time. Case histories are numerous showing that patients have waited patiently and hopefully for ten or twenty years, with myomata that produced no serious symptoms, only to come at last to the operating table because of some rapidly developing trouble dependent on the tumor. Consequently each patient must be followed to the end before we can say that there was no occasion for radical treatment in that case. But we cannot wait until all these things are determined before giving our patient advice.

What are the facts so far established, that will help to guide us in advising this patient?

a. Some myomata never give serious trouble. Reference is here made, of course, to clinical myomata—that is, tumors that were recognized during life or that could have been recognized had the patient come for examination. The small latent myoma nodules, found in such a large proportion of sectioned uteri removed post-mortem, are not now under consideration. A patient may go through a long and useful and happy life with a palpable myoma, and experience no particular difficulty from the growth. This fact has been demonstrated over and over again in clinical work and in autopsies on patients who have died of independent diseases or of senility. What proportion of cases run this course we do not know either exactly or approximately. We know only that "some"—a considerable number—have done so. This fact, however, is sufficient to overthrow the contention that "all palpable myomata should be subjected to operation." There is a mortality due to the operation. To be sure the mortality is small, under proper technique and surroundings, and will become much smaller as the cases are subjected to operation earlier and therefore under safer conditions. But even in the most favorable cases there is, and will continue to be, an occasional death from the operation. And before advising operation or other radical measures in any case we should, as already remarked, assure ourselves that the risk assumed is fully justified by the danger of delay in that particular case.

b. In a certain proportion of cases fatal complications have developed which were due to the tumor or would have been prevented by its early removal. Just what proportion of all clinical myoma cases have developed these fatal complications, or will develop them, we do not know, and cannot know in the present state of knowledge. Just what proportion of *operated* myoma cases have developed these complications has been determined in several series of cases, through the careful observation and painstaking labor of the physicians under whose care the patients came. No one can investigate this subject without coming to feel under personal obligation to the men who have taken

the time and the labor to prosecute this work in a reliable way and to place the results before the profession. To Dr. Chas. P. Noble, of Philadelphia, belongs the credit of stirring up the profession on this subject, by presenting and keeping before it incontestible evidence, from his own work and the work of others, of the great frequency of fatal and disabling complications due directly to these tumors or associated with them.

In a series of 1,278 cases collected by Noble (Noble 278, Scharlieb 100, McDonald 280, Martin 205, Cullingworth 100, Frederick 215, Hunner 100), there were found the striking number of 795 complications. However, in looking over this list it is seen that many of the complications are not serious and, of even the serious ones, some are in no way dependent on the presence of the tumor. In order to determine approximately what *proportion of the fatalities noted* could have been *prevented by early removal of the growth,* the author prepared the tabular analysis here given.

The number of tubal and ovarian complications prevented by early removal of the growth depends, of course, on the number of tubes and ovaries removed. This estimate was made on the basis of two-thirds of the tubes removed (hysterectomy in two-thirds of the cases and myomectomy in one-third) and half of the ovaries removed (both ovaries removed in one-third of the cases and one ovary removed in another third). Of course, if found advisable to limit myomectomy to a smaller proportion of the cases, more tubes would be removed and hence more tubal complications prevented.

As to whether myomectomy is preferable to hysterectomy in a considerable proportion of the cases, that is a question concerning which there is much interest to be said on both sides and it cannot be taken up here. However, there is no question but that, as early operation is more widely adopted, a larger proportion of the cases will be found suitable for myomectomy. In fact, the more frequent saving of the uterus is one of the benefits that will follow the adoption of early operation in these cases. The chance of later enlargement of small "latent" myoma nodules to the dignity of clinical myomata, is not so great as to deter us in preserving the uterus in suitable cases. Such growth takes place occasionally. Some months ago the author was obliged to remove the uterus for extensive multi-nodular intra-ligamentary myoma development in a patient, aged 31, who eighteen months previously had undergone myomectomy in a New York hospital. In this particular case the author attributed the rapid growth of the myomata partly to the chronic congestion of a severe pelvic inflammation, resulting in pyosalpinx, the infection evidently having been contracted some time after the first operation. Ordinarily, according to the reported cases that have so far come to the author's notice, this development of other tumors after operation has not taken place often enough to constitute a serious objection to myomectomy in suitable cases. Again, in certain cases, the preservation of the uterus is well worth the risk of a second or even a third operation.

In estimating the number of serious tubal and ovarian complications prevented by early removal of the tumor, the bare proportion of tubes and ovaries removed does not fully represent the proportion of complications prevented, for only apparently normal adnexa are left. Those tubes and ovaries which would show serious trouble later, are likely to show some abnormality at the time of operation and hence would be removed.

The table includes 1,905 cases, consisting of nine series of consecutive cases (Noble, 1,278, as mentioned above; Watt-Kenn, from Hofmeier's clinic, 417; Webster, 210). The question is: "What probable fatalities, from degeneration of the tumor or from local complications would have been prevented by early removal of the tumor?" and only the com-

plications bearing on this question are mentioned. In the first column (A) is given the number found of the particular degeneration mentioned. In the second column (B) is given the number of these that would almost certainly have been prevented by the early removal of the tumor. And in the third column (C) is given the probable fatalities from the latter.

NUMBER OF CASES 1,905	A	B	C
Necrosis of tumor	86	86	80
Suppurating tumor	10	10	8
Oedematous tumor	11	11	4
Myxomatous degeneration of tumor	56	56	40

NUMBER OF CASES 1,905	A	B	C
Cystic degeneration of tumor	53	53	30
Calcareous degeneration of tumor	36	36	6
Serious intra-lig. development of tumor	44	44	15
Malignant disease of tumor or of corpus uteri	65	65	65
Large hydronephrosis from tumor pressure	6	6	3
Twisted pedicle of tumor	33	3	2
Pyosalpinx	37	24	15
Salpingitis	127	84	12
Abscess of ovary	10	5	3
Carcinoma of ovary	3	2	2
Ovarian (cyst) including dermoids	118	75	60
Probable fatalities			345

This shows probable fatalities numbering 345, or 18 per cent, simply from the tumor degenerations and local complications mentioned, exclusive of other fatal and disabling effects of the myoma. This the author considers an ultra-conservative estimate. Were these cases traced to the end without operation, the number of deaths simply from the conditions specified would, in his opinion, considerably exceed the number here estimated.

In a report by Winter of 753 operated cases, malignant disease of the tumor or corpus uteri was found in 39 cases and total necrosis of the tumor in 17 cases. Thus, counting only two of the serious conditions mentioned in the table, it is found that they include nearly 8 per cent of his cases. In a later article by Noble, in which he analyzed a series of 2,274 cases, it was estimated that 23 per cent of the patients would have died, from degenerations or complications existing in the uterus or in the appendages or in the abdomen. In his study of a series of 4,480 cases in respect to carcinoma, he found carcinoma was present in 2.8 per cent (in corpus uteri 1.5 per cent, in cervix 1.29 per cent). In a careful examination of his own 337 consecutive cases, however, he found carcinoma in 4 per cent. As to sarcoma, Winter, in 500 cases in which

grossly suspicious areas only were examined microscopically, found sarcoma in 3.2 per cent, but in 253 cases sectioned systematically, sarcoma was found in 4.3 per cent. It is probable then, that if all tumors operated on late were subjected to systematic microscopic examination, malignant disease (sarcoma or carcinoma) would be found in 8 per cent.

c. In a certain proportion of cases, serious visceral degenerations appear in distant organs. The frequent association of heart disturbance with advanced uterine myoma, has attracted much attention. The proportion of cases showing heart disturbance is striking. Winter had 266 consecutive cases examined for heart diseases and found heart disturbance in 40 per cent. In five series carefully examined (Winter 266, Strassmann and Lehmann 71, Boldt 79, Fleck 325, Webster 210), the number showing heart disturbance varied from 25 to 47 per cent, averaging 38 per cent for the whole 951 cases. Of course, a certain number of these heart disturbances would have been found in any series of patients. But making due allowance for these the number is too marked and constant to be a mere coincidence. The exact connection between the two has not been worked out. But whether the heart disturbances are due principally to the chronic anemia from hemorrhage or to the direct action of some toxin manufactured in the myoma, or constitute simply an associated product of the same conditions that produced the myoma—whatever the cause—the fact remains that they are and must be reckoned with. Some of these are minor functional disturbances but on the other hand many are of serious import. That such is the case is shown by Baldy from the records of the Gynecian Hospital. In a series of 3,413 operations, sudden post-operative death due to circulatory disturbance occurred 16 times. Thirteen of these sudden deaths occurred in the 366 myoma cases, while the 3,047 other operative cases furnished only 3 such deaths. It occurred 36 times as frequently in the myoma cases as in the general run of operative cases.

Other visceral degenerations from the chronic anemia and from pressure on the ureters and from other effects of the myoma, produce fatalities due really to the myoma, but attributed to other causes.

d. We must be careful to avoid drawing erroneous conclusions from statistics. Let us consider critically some of the facts put forward against the idea that myoma causes death in any considerable proportion of the cases.

General mortuary records show only an insignificant death rate from this disease. The U. S. Census (1900) shows 657 deaths from myoma of the uterus in a population of about 37,000,000 females. The Great Britain Census (1901) shows 339 deaths from myoma of the uterus in a population of about 17,000,000 females. There is a striking agreement here, both indicating that the death rate is about 1 in 50,000—a very soothing proposition to one called to treat a patient so afflicted. But was this all the deaths from myoma disease in that time? Do not the numbers here given represent simply the cases in which nothing else could be found to account for the death? How about the myoma

patients that died of kidney disease, of heart disease, of anemia, of "uterine hemorrhage," of uterine "cancer" (cancer of the endometrium associated with myoma or a sloughing myoma mistaken for cancer), of salpingitis, of peritonitis, and of other conditions due directly to the myoma or that would have been prevented by its early removal? Until we count the deaths due to these complications, the census figures amount to very little as showing the deaths due to myoma disease. They show simply that, in the countries mentioned, few patients die of *uncomplicated* myomata.

Hospital records of myoma cases show few deaths among them. In St. Bartholomew's Hospital, among 547 uterine myoma cases there were but 29 deaths, and 28 of these followed operation. Here is a series of 547 myoma cases only one of which died of the myoma while 28 died of the operation—accurate records, careful diagnosis, thoroughly reliable report. What shall be said to that? Before deciding as to the practical significance of these figures some additional information should be sought. How many of the 28 patients who died following operation, would have died without operation? How many of the 547 patients with myomata were saved from death by operation? What was the after-history of each one of the nonoperated cases? When this additional information is obtained, then we will have some idea as to how many deaths from myoma would have occurred without operation in this series of 547 cases. Practically the same deficiencies appear in all hospital series of myoma cases, and in a measure necessarily so, for hospital records cannot show the number of nonoperated cases that come to death or operation after they leave the hospital.

Large series of cases from private records show only a small proportion of the patients in really serious condition. There are many such reports. A typical one is that of Dr. E. J. Ill, of Buffalo, in which he reports all myoma cases seen by him in the preceding three years. There were 300 cases. He operated on 53 and advised operation in 6 others, making 59 cases in which operation was required according to the indications that he followed. So we have here a large series of myoma cases, carefully observed and reported, and in only about 18 per cent was "life endangered" or "health so impaired that life was a burden." Eighteen per cent of serious terminations is not a small per cent for what some are pleased to style a "harmless growth." But is that the total number of serious terminations in the whole 300 cases? How many of the patients who were in good condition when he last saw them will progress to the same stage of the disease in which he saw the 18 per cent? Myoma of the uterus is a very slow-growing tumor. It may gradually progress over a period of twenty years or more. Taking off the first five years, as the tumor may not come under observation then, we have fifteen years of the growth's progress in which the patient is likely to consult a physician. If in a mixed series observed during a period of three years, 18 per cent are found to have reached the serious condition mentioned, what per cent will have reached the same

condition when the same series has been observed six years or nine years or twelve years or fifteen years? Of course, it would not be true to assume that because observation of the series for three years showed serious terminations in 18 per cent, observation of the same series for fifteen years would show serious terminations in 90 per cent, but it would be much nearer the truth than the assumption of 18 per cent as the total serious terminations in the 300 cases.

Physicians see but a small number of their myoma cases to the end. The patient in the earlier stages of the disease drifts from one physician to another, helping to swell the list of patients "not requiring operation" for three or four or more physicians. Later there develop threatening symptoms demanding operation, which is carried out. In the records of the last physician only does the case appear as one "requiring operation." So from this one case, finally operated on, there would be statistical proof that operation is required in only 20 per cent of myoma cases. This shows how easy it is to fall into serious error. Even in the occasional case which is seen through all stages by one physician, the progress is so slow and the last stage is so far removed from the first, that the relation of cause and effect is in a measure overlooked. If the end came in two or three years, as in cancer, it would be impressive, but the first appearance of the tumor and the ultimate result being so far separated, the connection is somehow lost. The case seems an exceptional one, some new factor at work—the terminal condition can hardly be recognized as due to the "harmless" fibroid which the patient has carried so many years without particular trouble.

The author mentions these things because he believes that many are misled by them. The latest contribution to this part of the subject that has come to his notice, is that by Thos. Wilson, of Birmingham, England. He assures us on practically the same deceptive evidence (the analysis of a series of cases seen for a short time), that of myomata giving rise to symptoms, only 30 per cent require removal. The remaining 70 per cent require merely watching and minor palliative treatment. As to what eventually becomes of this 70 per cent he furnishes no proof. However, in the recommendations for the care of them, after giving directions for the relief of various distressing symptoms, he states, "And, finally, operation should be recommended when bleeding gives rise to anemia and does not yield to ordinary treatment; when pain is severe and obstinate; when pressure symptoms, especially retention of urine, occur; when the tumor is rapidly increasing in size; and generally when there is evidence that the health of the patient is becoming impaired"—and he might have added, when the kidneys are damaged; when the cardio-vascular system is seriously affected; when the patient is in bad condition for operation; and when the operative mortality is necessarily high. The enumerated conditions secured by waiting would better have been avoided by the prompt adoption of radical measures.

Summarizing the important facts of the subject, the following conclusions may be drawn:

1. A myoma of the uterus, which has reached a size to be appreciated clinically, is a much more serious affection than is generally supposed. A considerable proportion of the patients develop fatal local conditions, another considerable proportion develop serious distant visceral degenerations, and a large proportion of the remainder (possibly most of them) finally pass into a condition of chronic suffering and invalidism.

2. The progress of the disease is so slow as to be deceptive, many cases taking fifteen to twenty years to reach full development—hence the serious results do not appear in the observation of a series of cases for a few years, a few years constituting but a fraction of the developmental period. Yet the widespread teaching that serious conditions develop in only a very small proportion of the cases, is based largely on just such limited observations, recorded and unrecorded. No large series of consecutive cases followed to the end without operation has shown a small mortality.

3. Uterine myoma kills principally by inducing serious local and general complications, which complications go down in the mortuary records as the cause of death—hence mortuary records give no indication of the ravages of the disease. It kills secretly and indirectly, but none the less surely.

4. The proportion of the various classes that (a) go on to a fatal termination or (b) become chronic sufferers and invalids or (c) develop no serious symptoms, can be exactly determined only by securing accurate records of a large series of cases, comprising all classes, from the beginning of the trouble to the end.

5. Enough is already known to show that delay is dangerous. Many patients develop fatal conditions, many find operation necessary when in such a state as to make the operation exceedingly dangerous, and some must be refused operation because of advanced complications—nearly all of which loss of life and health could have been prevented by early treatment.

6. The chance of satisfactory improvement after the menopause is, speaking generally, more than overbalanced by the frequency of serious degenerative changes and complications.

7. We assume a grave responsibility when we advise a patient to wait until serious symptoms develop before having curative treatment. Taken in time many myomata may be cured completely by radium or x-ray treatment. The cases requiring operative removal are also much more safely handled before serious complications develop. Early operation, under proper conditions, means small risk to the patient. Late operation means great risk.

8. For advice as to whether or not active treatment is required, patients may be grouped as follows:

a. A patient who has a small myoma that is causing no symptoms, requires no treatment for the myoma. Such tumors are rarely seen. Occasionally one is discovered in the course of an examination for symptoms plainly due to other cause. In such a case it is well not to mention to the patient that she has

a myoma, unless she asks directly concerning it, though it is advisable to state the fact and its bearing to the husband or other responsible relative.

b. A patient who has a tumor of moderate size, causing only slightly troublesome symptoms which may yield to general tonic treatment with the addition of uterine astringents, is put on that treatment for one to three months—long enough to satisfy one as to whether the symptoms will subside under this treatment. If they do subside, the treatment is continued as necessary to control the symptoms. By "control" of the symptoms is not meant just to the extent that the patient can manage to get along as a semi-invalid, but to such an extent that they are not noticeable to her—that she is practically a well woman.

c. If it is found that the symptoms persist after a satisfactory trial of the above treatment, it means that they are due largely to the activity of the tumor, and not simply to the accompanying pelvic congestion (depending principally on some minor inflammatory trouble or on constipation or on methods of work or on other cause independent of the tumor). The persistence of symptoms, after a satisfactory trial of the measures to eliminate symptoms due to other causes, means that the tumor is already an active irritant in the pelvis, and that effective treatment for it should be adopted.

d. In cases where the tumor is causing symptoms that plainly cannot be corrected by other measures, radical treatment at once is to be recommended without wasting time with other measures.

9. In the curative treatment of myomata, three measures are employed—radium, x-ray and operative removal.

The subject of choice between radium, x-ray, and the knife, in the treatment of uterine myoma and uterine cancer, presents much confusion at present, and the differences of opinion expressed are too marked and radical to be simply errors of observation. There are two important factors back of this situation. The first is the newness and incompleteness of the knowledge concerning radium and x-ray therapy. The information concerning them is coming in so rapidly that a considerable part of it is still undigested, as far as sustaining clinical practice is concerned. Some opinions are evidently based on enthusiastic hopes rather than on tested evidence. The second factor is that many of the radical pronouncements as to treatment are by workers familiar with only one or two of the measures under consideration.

Having all three measures available and wishing to give each patient what was best for the special conditions present in her case, the author has for a considerable time been making a study of this particular phase of the subject, i.e., of the *choice* in the individual case. In a subject which is growing so rapidly and in which so much of the knowledge is new and more or less obscure, particular care is required to be sure that the choice is based on established facts; for facts and fancies intermingle confusingly in the literature of these measures. While the choice of treatment must shift according to new evidence coming in, a certain amount of conservatism or

critical "show me" spirit in the physician is invaluable to the patients who depend upon him in these serious conditions.

In uterine myoma the three measures mentioned, rightly used according to present knowledge, are not antagonistic or exclusive one of the other. Rather they are supplementary. Each has its field in which it is clearly the best treatment. The edges of the fields merge, of course, giving classes of cases in which the choice is not strongly one way or the other. The future may witness marked changes in these fields but for the present the following represents the author's working choice in the different classes of cases.

Radium

Radium is the preferable form of treatment in the following classes of cases:

a. In uncomplicated small and medium-sized myomata in patients in the menopause or near the end of the child-bearing period. Persistent bleeding is usually the serious symptom in these cases and this is promptly controlled by radium, which checks all bleeding, menstrual or otherwise. Nearly all properly selected cases prove amenable to this treatment. In approximately 400 reported cases, satisfactory results were secured in about 95 per cent.

In the cases of myoma apparently suitable for radium treatment, complicating carcinoma of the endometrium must be excluded by curettage. This is very important. The author found this unsuspected complication in two cases within the last year. Each case presented myomatous nodules of the size and type suitable for radium treatment. Following his custom at radium application, the author made a preliminary curettage and sent the scrapings for routine examination. The laboratory returns showed complicating endometrial carcinoma, and this diagnosis was confirmed in each case by the findings in the removed uterus. In one case the associated carcinoma was rather extensive and in the other case it was still confined to a small area.

In young women the preservation of the child-bearing function and of menstruation is desirable, hence in this class myomectomy is preferable to radium.

b. In patients with kidney, heart and other complications giving undue operative risk, radium may reasonably be tried in the somewhat larger growths, especially in those cases where x-ray treatment produces such marked nausea and ill-feeling that it is not advisable to continue it.

In these complicated cases, also, carcinoma of the endometrium should be excluded by preliminary curettage, if possible. Of course, in these seriously complicated cases, general anesthesia is to be avoided. In the author's experience the curettage and radium application may in most of these cases be accomplished under morphia-hyoscine analgesia. In the exceptional cases where necessary this analgesia may be supplemented by local infiltration-anesthesia of the cervix or by short ether inhalation, as preferred.

X-Ray

The larger growths in patients presenting undue operative risk are best handled by deep x-ray therapy. In most cases this will, after a time, stop the bleeding temporarily and give a chance to build up the patient for operation. If she cannot be gotten into condition for operation, continuation of the x-ray treatment may stop the bleeding permanently and diminish pressure-symptoms by shrinking the growth.

If preferred, the smaller growths also may be treated by x-ray instead of radium, with practically the same percentage of symptomatic cures. In over 600 reported cases of myoma treated by x-ray, the bleeding was stopped in approximately 95 per cent. However, the x-ray treatment has the disadvantage of extending over a long period or, if given in more massive doses in a short period, of upsetting the patient's digestive and nervous systems, in some cases to a serious extent. The author has had several patients who complained bitterly of this disturbance from x-ray treatments, stating that they would prefer the danger and discomforts of operation to another such course. So he now uses radium therapy in the myomata that are small enough to be suitable for it.

As a rule the x-ray treatment should be preceded by *diagnostic curettage,* to exclude complicating malignancy. Occasionally the circumstances of the case are such that one feels justified in taking the risk of omitting the diagnostic curettage, at least for a time. A serious coincident disease may make it advisable to avoid any upset to the patient's physical or nervous balance. The author recalls three cases during the past year in which this rather risky plan was followed. In one the cardiovascular condition contraindicated any upset to the patient, such as curettage, and yet the persistent bleeding was making the condition steadily worse. Under x-ray treatment the bleeding stopped for several months, enabling the patient to get into very much better condition. Later, when the bleeding started again, the myomatous uterus was promptly removed while the patient was still in fair condition. There was considerable degeneration in one of the large nodules but no malignancy either there or in the endometrium. In another patient with a large tumor, persistent bleeding and severe anemia, the cardiac breakdown was so marked that it was not expected the patient would ever rise from her bed. Under x-ray treatment the bleeding stopped, and under suitable medication and diet the anemia and cardiac condition improved, and now after several months the patient is up and about and comes to the office. So far, there has been no return of the bleeding. The third patient, in addition to a myoma which she had not noticed, had a nervous or mental disturbance that made it inadvisable even to suggest the presence of any serious trouble in the pelvis. Under x-ray treatment the bleeding associated with the uterine myoma stopped and has not returned after some months. The patient will, of course, be kept under observation. This plan, however, is a risky

procedure and is to be adopted only in those very exceptional cases in which any upset to the patient is strongly contraindicated.

Operation

Operative removal of the myoma is the preferable form of treatment in the following classes of cases:

a. The large growths, from the size of a grapefruit and upward, are generally best handled by operation. It is not practicable to fix an arbitrary limit of size, as other conditions have a bearing on the decision. For example, pediculated subperitoneal growths are not so favorable for radium or x-ray treatment as growths embedded in the uterine wall and hence must more often be removed by operation. Again, a single large growth is not so favorable for nonoperative treatment as a myomatous uterus enlarged to the same size by a number of small nodules.

b. In young women in whom preservation of the child-bearing function and of menstruation is desirable, myomectomy is the preferable form of treatment, where any serious treatment at all is necessary. In many of these cases the myomata may be removed without disturbing the functions of the uterus. However, a point to be kept in mind is that when the abdomen is opened it *may* be found necessary to sacrifice the uterus in order to remove the tumors completely. Hence myomectomy should be advised only after careful consideration of all the features of the case. If the growths are not of a size and location necessarily interfering with pregnancy or labor, it would be well to try first to check the bleeding by other means, such as curettage and internal medication. If these measures fail it may be advisable in exceptional cases to employ light doses of radium or x-ray, with the idea of giving just enough to control abnormal bleeding but not enough to affect ovarian or uterine function seriously. But in spite of advances made in the regulation of dosage and the enthusiastic assumptions of some authorities, this use of these measures must be with very decided caution. If the x-ray is used, it is preferable to apply it to one side only, so that one ovary will remain unaffected.

c. In complicated cases the complications often make operation advisable in a growth which if uncomplicated would be suitable for radium or x-ray treatment. The complication may be inflammation of some adjacent structure, for example, appendicitis or salpingitis. Such associated trouble is found in a considerable proportion of the cases of myoma. The complication may be inflammation or degeneration of the myoma itself. Degeneration is common in the larger growths, especially in the subperitoneal masses. A myoma that takes on growth after the menopause is probably undergoing a degenerative change of some kind and should be promptly removed if the patient is a safe operative risk.

SELECTION OF OPERATIVE METHOD.

When operative treatment is decided upon, then comes the question as to what form of operation is best suited to that particular case. Shall the approach be by way of the abdomen or by way of the vagina? Shall the tumor alone be removed or shall the uterus be removed along with the tumor. If the uterus is removed, shall it be by supravaginal hysterectomy or complete hysterectomy?

Abdominal Operation.

In the following classes of cases the tumor is best attacked by way of the abdomen:

1. When the tumor and uterus form a mass clearly the size of a fist or larger, or when the approximate size cannot be definitely determined. In such a case the abdominal route is clearly indicated. To be sure, it is possible to remove a mass this size or larger by vaginal operation—in fact, a mass of almost any size may be removed by way of the vagina. But the removal must be made piecemeal (by morcellation) and the disadvantages ordinarily far outweigh the advantages.

2. When there is extensive adnexal inflammation associated with the tumor. Even though the mass formed by uterus and tumor is comparatively small, the presence of extensive adhesions throughout the upper pelvis makes operation from above the safer plan. The myomatous uterus and the disorganized adnexa may be thus more safely and more thoroughly removed.

3. When there is some other suspected lesion, as of the appendix or gall-bladder, requiring treatment or exploration. The other lesion may be taken care of at the same time the tumor is removed, or the region in question (the upper abdomen) may be simply explored and the exact conditions ascertained, to be taken care of later by operation if the symptoms necessitate it.

4. When the lesion is of doubtful character and so obscure that a complete exploration of the upper pelvis is required.

Having selected the abdominal route, the next question is as to the extent of the operation. Taken up in the order of frequency of employment the abdominal operative methods are: supravaginal hysterectomy, complete hysterectomy, myomectomy and resection of corpus uteri. The main features of the various methods are indicated and contrasted in Figs. 505, 506 and 507.

Supravaginal hysterectomy (Figs. 385 to 406). This is the form of operation preferable in most cases. Myomata which have reached a size to give decided trouble are usually multiple and have involved the corpus uteri to such an extent that its removal is advisable. A large proportion of the patients are past thirty-five and at that age the preservation of the uterus is not so important as it would be earlier in life. Supravaginal hysterectomy is the rule. Preservation of the damaged uterus (myomectomy or resection of

corpus uteri) should be employed only for special conditions to be mentioned later.

The *preservation of the cervix uteri* is a matter which has occasioned much dispute and there is plenty of ground for a difference of opinion. The author prefers to leave the cervix except when there is some special reason for removing it. Its preservation simplifies the operation, thus reducing the danger to the patient. Also, it lessens the extent of the traumatism in the pelvic connective tissue and insures a more nearly normal pelvic floor and vaginal vault. The physiological and technical advantages of leaving the cervix are beyond question. The stubborn fact, that will not down and that stands as a specter imperatively demanding a close study of the question, is this: that in a number

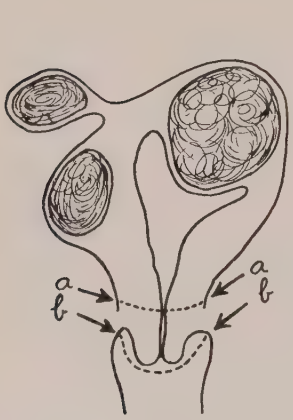


Fig. 505.

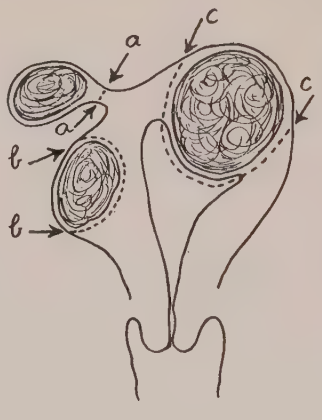


Fig. 506.

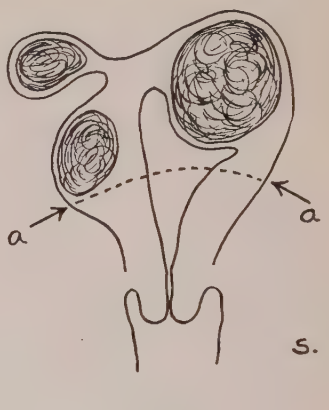


Fig. 507.

Figs. 505, 506 and 507. Contrasting the principal abdominal operations for myoma and showing the main features of each at a glance.

Fig. 505. The arrows *a-a* indicate the line of excision in supravaginal hysterectomy. The arrows *b-b* indicate the line of excision in complete hysterectomy.

Fig. 506. The arrows *a-a* indicate the line of excision in myomectomy for pediculated fibroid. The arrows *b-b* indicate the same for an interstitial fibroid. The arows *c-c* indicate the same for a submucous fibroid.

Fig. 507. The arrows *a-a* indicate the line of excision for horizontal resection of the myomatous uterus.

of cases treated by supravaginal hysterectomy, the patient has later died of malignant disease of the cervix. It is easy to say, "For that reason we should remove the cervix in all cases." That would be an easy solution of the problem so far as the operator is concerned, but in the opinion of the author, it is not the best from the standpoint of results to the patient. The mortality would be higher and the morbidity would be higher, all for the purpose of attaining a security which can be obtained by a method that is decidedly safer though somewhat more troublesome. That method is to observe the following precautions before and during and after the operation:

Before operation. Examine carefully to exclude malignant disease of the

cervix or corpus uteri, making a microscopic examination of clippings or scrapings if necessary, in a suspicious case. Examine to see if the cervix is severely lacerated or the seat of chronic irritation from any cause. If there is no evidence of malignant disease in the uterus and no severe laceration or chronic irritation of the cervix, the cervix may be safely left.

During operation. If the conditions are at all doubtful, the myomatous uterus is to be laid open and the endometrium examined for carcinoma. The time for this examination is just after amputation of the corpus uteri and before the lateral pedicles are fastened to the cervix. The specimen may be quickly opened by an assistant and inspected by the operator. The main tumor or tumors also may be laid open and examined for sarcomatous areas. If anything suspicious of carcinoma or sarcoma is found, the cervix is to be removed.

After operation. If in the subsequent examination of the specimen any suspicious area is found, it is to be submitted to microscopic examination. If malignant change is demonstrated, the cervical stump is to be promptly removed per vaginam, preferably by the clamp method.

Complete hysterectomy (Figs. 411 to 431). Removal of the cervix along with the corpus uteri is indicated in the following classes of cases:

a. When there is undoubted malignant disease of the corpus uteri. Ordinarily the cervix should be removed without cutting across it. Incision across the cervix carries the danger of implantation of cancer cells and also the danger of pyogenic infection.

b. When there is any suspicion of malignant disease, either before removal of the corpus uteri or after its removal and sectioning.

c. When the cervix is severely lacerated and the seat of infiltration and chronic irritation.

d. When the myoma involves the cervix, thus necessitating its removal.

Myomectomy (Figs. 435 to 443). Removal of the tumor with preservation of the uterus is indicated in the following conditions:

a. In cases in which the tumor is pediculated and the uterus practically normal.

b. In patients in whom it is particularly important to preserve the uterus and the tumors are few and of such character and location as to permit of enucleation.

Resection of corpus uteri (Figs. 444 to 454). Removal of the tumor-bearing area of the uterus with preservation of a part of the corpus uteri for the continuation of menstruation, is indicated in those cases in which the tumors are favorably located and the patient comparatively young.

Vaginal Operation.

In the following classes of cases the tumor is preferably attacked by way of the vagina, as indicated in Figs. 455 to 504:

1. When the mass formed by the tumor and uterus is clearly small enough to be removed per vaginam without bisection and there are no adhesions that would seriously interfere with bringing the uterus down.

2. When the patient is in such condition that it is necessary to avoid the shock and extensive peritoneal handling of abdominal operation. In these poor surgical risks, rapid hysterectomy by the clamp method is usually the preferable plan. In some cases vaginal operation is advisable though the size of the fibromyomatous uterus necessitates its bisection or even morcellation.

3. When the tumor of the corpus uteri is clearly of such location and size that vaginal section will permit satisfactory exploration of the tumor and its removal (vaginal myomectomy).

4. When the tumor is pediculated and projects into the cervix or vagina and there are no tumors higher necessitating abdominal operation.

5. When the tumor is entirely cervical or so low in the corpus uteri that it may be readily removed by way of the vagina.

PREGNANCY AND MYOMA.

The association of myoma with pregnancy is always a matter for serious concern, though many patients get along without trouble. Lafour, in a series of 300 cases of myoma and pregnancy in which delivery took place by way of the birth canal, found the maternal mortality 40 per cent and the infantile mortality 77 per cent. In a series of 147 cases of myoma and parturition collected by Susserott, the maternal mortality was 53 per cent and the infantile mortality 66 per cent. In 20 per cent of these cases forceps were used, with the loss of 8 mothers and 13 children.

Johnston estimated that during pregnancy or labor one-third of the mothers and more than one-half of the children die, and recommends celibacy when the tumor cannot be removed. Rosenwasser said in 1899 that antisepsis and improved technique had reduced the maternal mortality only to 27 per cent.

Methods of Treatment.

1. Non-interference. The patient is allowed to go along until term, in the hope that there may then be a satisfactory delivery (spontaneous or operative). As mentioned later, this is the preferable plan in many cases. The results have been reported in various series of cases, as follows:

Spontaneous delivery. In a series of 84 cases of labor complicated by myomata, 64 per cent of the patients managed to deliver themselves, while 36 per cent required assistance by forceps or otherwise.

Forceps. In Veit's series of 39 forceps cases, the maternal mortality was 33 per cent and the infantile mortality was the same.

Version. In Veit's series of 87 version cases the maternal mortality was 64 per cent and the infantile mortality 82 per cent.

In myoma cases there seems to be a marked tendency to *adherent placenta.* In a series of 147 cases of myoma complicating labor, manual removal of the placenta was necessary in 21 cases, and 13 of these women died. This serves to call attention to the difficulties of this condition, which is always a serious one in the presence of myoma.

Cæsarean section. In Sanger's series of 43 cases, the maternal mortality was 83.7 per cent and in Pozzi's 28 cases the maternal mortality was 86 per cent. In 48 Porro operations in myoma patients, the maternal mortality was 33 per cent. In a later series of 49 cases of the Porro operation in myoma patients, the maternal mortality was only 12.5 per cent, showing that immediate removal of the myomatous uterus is the safer operation.

2. Myomectomy. The patient is subjected to operation for the removal of the tumor, but the pregnancy is allowed to continue—if it will. Leopold, in his myomectomies in the pregnant uterus, from 1884 to 1894, had a maternal mortality of 17.4 per cent, and a fetal mortality of 37.6 per cent. Stavely had a maternal mortality of 24.2 per cent. The probability of abortion is great and must never be lost sight of, though many cases of extensive myomectomy have recovered without abortion. Olshausen reported 21 myomectomies. Abortion followed in 38 per cent. In a series of 57 myomectomies and enucleations during pregnancy, 12 per cent of the women died and 24 per cent aborted.

3. Hysterectomy. The myomatous uterus is removed in early pregnancy. In a recent series of 89 cases of supravaginal hysterectomy for myoma complicated by pregnancy, the mortality was 11 per cent. When the operation is carried out promptly (before serious complications intervene) the mortality is very little higher than hysterectomy in the nonpregnant.

4. Induced Abortion. As the patient is in a serious condition and her life threatened, the plan of emptying the uterus has been suggested and carried out. Lafour collected 39 cases of myoma and pregnancy in which this method of treatment was employed. The mortality was 36 per cent. In the case of a myomatous uterus the dangers from abortion (spontaneous or induced) are great, because of the difficulty of completely emptying the uterus and the consequent frequency of hemorrhage and sepsis.

Selection of Treatment.

The treatment to be employed depends on the size and location of the myoma and the stage of pregnancy at which the patient is seen.

When the tumor is in the upper part of the uterus and is of small or medium size and not causing much trouble, it should be let alone until after parturition.

When the tumor is so large or so situated (cervix myoma) that it precludes the possibility or probability of full-term delivery per via naturalis, the treatment turns somewhat on the stage of pregnancy. If the patient is seen in early pregnancy, hysterectomy is the safest plan of treatment. In some exceptional cases the tumor may be so situated that myomectomy (abdominal or vaginal), with hope of continuing the pregnancy is justifiable.

If the patient is first seen in late pregnancy, it may be advisable to postpone operation until full term or nearly full term, with the hope of saving the child by Cæsarean section.

Of course, there are all gradations in seriousness, from the cases where it is almost certain that there will be no trouble to the cases in which full-term delivery by the natural route would be absolutely impossible. It is the middle class that contains the cases that furnish the most puzzling problems. When seen in early pregnancy there is an uncertain factor, namely, the probable extent of development of the myoma during pregnancy. This makes it difficult in some cases to decide just which line of treatment is preferable. In cases of doubt after giving due consideration to the various aspects of the case, the rule is to await developments.

A large class of myoma cases complicated by pregnancy, is that in which the patient has one or more myomata that give no particular trouble until she becomes pregnant. After the patient has been pregnant three or four months, the myomatous uterus becomes intolerant of the growing contents. Bleeding and pains, persisting in spite of sedative treatment, show that miscarriage is inevitable and the embryo has probably already perished. Shall the myomatous uterus be emptied or shall it be removed? The conditions vary much in different cases and the decision must rest, of course, upon a careful study of the individual case. In some cases the location and size of the myomata indicate that they have but little to do with the threatened miscarriage and in such a case the treatment is practically the same as for threatened miscarriage in a normal uterus. In those cases, however, where the number and size and location of the myoma nodules indicate that they are responsible for the impending miscarriage, hysterectomy or myomectomy is the preferable plan of treatment, for the following reasons:

a. The marked distortion of the uterine cavity by the tumors may render the complete emptying of the uterus impossible.

b. There is danger of serious hemorrhage on account of the inability of the uterus to properly contract after being emptied.

c. Sepsis is very liable to occur in these cases in spite of the greatest care On account of the persistent bloody discharge, bacteria may already have propagated into the uterine cavity. The lymph spaces opened by the intrauterine instrumentation, the placental remnants left in inaccessible parts of the distorted cavity and the traumatism of portions of the tumors near the mucosa, all favor sepsis and increase its seriousness.

d. There is a possibility of having to do a hysterectomy a few days later in the presence of active infection, when the danger would be very much increased.

e. Even though the uterus were successfully emptied and the patient recovered, tumors so situated would probably continue to cause trouble necessitating operative removal sooner or later.

CHAPTER VII.

CARCINOMA OF CERVIX UTERI.

This subject will be considered under the following heads and subheads:

Technique of Operative Treatment.

Radical abdominal operation.
Radical vaginal operation.
Palliative operations.

Indications for Operative Treatment.

For radical operation.
For palliative operation.

Choice of Operative Method.

For radical operation.
For palliative operation.

TECHNIQUE OF OPERATIONS.

It is hardly necessary, in this day, to enter into a detailed explanation of the fact that a radical operation for malignant disease of the cervix uteri must be much more than a hysterectomy. A hysterectomy is no more a radical operation for cancer of the cervix, than an amputation of the breast is a radical operation for cancer of the breast. In each instance, the tissue containing the regional lymphatic drains (vessels and small glands), which may have cancer cells at any part of their course, are to be removed as completely as possible. This takes care of the numerous delicate extensions in the immediate vicinity of the palpable mass. It means, in cervix cancer, the wide removal of the parametrium, around and beyond the ureters.

The ideal operation would include, also, removal of the first set of catch-basins (glands) in which the lymphatic drains of the system terminate. In the case of breast cancer this is practicable, and the removal of the axillary glands along with the connecting lymphatics is a routine step in every radical operation for cancer of the breast. In uterine cancer, on the other hand, this has been found to be not practicable. The impracticability rests upon two facts, each of which has been established by extensive investigation and experience. In the first place, the lymphatics from the cervix uteri are distributed directly to widely separated and deeply situated gland groups, as indicated in Fig. 546. Hence the attempted complete removal of the first set of catch-basins meant very extensive operative work, added to an operation which already taxed

the strength of the patient to the limit. The result was a frightful increase in the operative mortality. In the second place, it was found that this extensive gland removal did very little good. In the cases in which microscopic examination showed that distant glands were really involved, recurrence was so uniform as to show that in nearly every case, more distant structures also were involved. There was an occasional case in which no recurrence took place, but these exceptional cases were too rare to justify routine gland removal. In selected cases, one may feel justified in subjecting the patient to the additional risk of extensive gland removal, but as a general proposition, gland removal should be very limited. It is of benefit principally for prognostic purposes.

Radical operation for cancer of the cervix uteri comprises, then, removal of the uterus and parametrium beyond the ureters (see Fig. 533) and removal of a cuff of vaginal wall—all in one mass and without unnecessary manipulation of the involved tissue. This may be accomplished by way of the abdomen or by way of the vagina.

Radical Abdominal Operation.

The development of this extensive and life-saving operation was gradual, and was due to the splendid work of many operators and investigators. Among those who assisted materially in this development may be mentioned Ries, Werder, Clark and Sampson, in this country, and a number of workers abroad, notably Freund and Wertheim. The latter, by his extensive pathological studies and his careful working out of the details of technique, has done probably more than any other one person to establish the operation on a firm basis and bring it to its present state of perfection.

The prevention of shock is a most serious problem in this operation. The extensive work required, deep in the pelvis, necessarily takes much time. The long anesthesia, the associated blood-loss and the post-operative strain on kidneys and heart, prove too much for certain individuals. Sepsis is another important factor in the mortality. A broken-down, discharging growth contains infective bacteria, which contaminate the operative field and may lead to fatal sepsis. Every large series of cases shows a number of deaths due to this cause.

In planning the operation, therefore, special precautions must be taken to diminish shock (anesthesia, blood-loss) and to prevent sepsis. The work is executed as follows:

Regular steps:

1. Disinfection of the vagina and tumor.
2. Opening the abdomen and clearing the field.
3. Freeing the upper part of the uterus.
4. Separating the bladder.
5. Freeing the ureters.
6. Freeing the cervix posteriorly.

7. Wide excision of the lateral parametrium.
8. Clamping and cutting across the vagina.
9. Closing the vaginal stump.
10. Ligating the parametrial pedicles.
11. Closing over with peritoneum.
12. Treatment of the bladder.

Variations:

Transverse abdominal incision.
Primary exposure of the ureters.
Removal of lymphatic glands.
Ligation of the internal iliac arteries.
Repair of bladder wounds.
Uretero-vesical anastomosis.
Uretero-ureteral anastomosis.

Regular steps. *1. Disinfection of the vagina and tumor.* Conditions differ in different cases. If there is little or no papillary growth, the free application of picric solution (5 per cent) may be all that is needed. It is applied freely to the vaginal wall, the cervix uteri and, if desired, to the uterine cavity by packing with moistened gauze.

In the cases where there are large papillary masses harboring bacteria in their crevices and in the tissues themselves, they should be cleared away by the large curet. All soft, broken-down tissue is removed and the bleeding base is sterilized by picric solution or by the cautery. The cautery should be only hot enough to coagulate the adjacent tissues and thus check bleeding, seal lymph-spaces and kill cancer cells and bacteria. If too hot it fails to stop bleeding or produce satisfactory thermo-coagulation. After the cauterization, it is well to pack the picric gauze into the uterus and apply it freely to the exposed surfaces. This excochleation and sterilization should immediately precede the radical operation. If carried out a few days or a week before the operation, it seems to stir up more inflammation. This point is emphasized by Wertheim, who states, "We invariably practice the preparation immediately before the operation. If it be done several days before the operation an opportunity is given for inflammatory reaction, which is caused by germs squeezed out into the tissues during the excochleation. In spite of a most carefully conducted preparation and antiseptic tamponade, new infective secretion will develop from the carcinoma."

After the special preparation, dry gauze is packed into the vagina to absorb any discharge which may be pressed out of the uterus. This gauze is removed just before the vagina is clamped, as explained later. This disinfection of the vagina and tumor should be carried out before anesthesia wherever possible, particularly if general anesthesia is used.

2. Opening the abdomen and clearing the field. The hips are elevated into marked Trendelenburg posture and the abdomen is opened by a median incision which extends from the symphysis to near the umbilicus. The incision should be extended close to the symphysis as that gives more room for the work in the pelvis. The incision is held open by a self-retaining spreader, the intestines are pushed into the upper abdomen and the pelvic cavity is walled off with gauze. If there are adhesions, they must be separated and the pelvis must be thoroughly cleared, otherwise the difficulties of the operation are much increased.

The pelvis is now carefully explored and the supposed operability of the tumor confirmed or disproved.

3. Freeing the upper part of the uterus. The fundus is grasped with a holding forceps and drawn strongly forward and upward. The infundibulopelvic ligament of one side is ligated and divided, as shown in Fig. 508, and the perito-

Fig. 508. The Radical Abdominal Operation for Cancer of the Cervix Uteri. The right ovarian vessels have been ligated and divided. The peritoneum is to be divided in the direction indicated by the arrow.

neum is incised toward the round ligament. The round ligament is ligated and divided, as indicated in Fig. 509. The same steps are then carried out on the other side (Fig. 510). The corpus uteri is now nearly free at the sides.

4. Separating the bladder. The peritoneum is now loosened from the front of the uterus and divided across as indicated by the dotted line in Fig. 510. The vesical fold of peritoneum is then drawn forward by a forceps and the bladder is separated from the cervix by gauze, wrapped about the finger (Fig. 511) or held in a forceps. This separation is continued down the cervix as far as possible without causing undue bleeding. The complete separation of the bladder cannot be made at this time. That is made later, after ligation of the uterine vessels and isolation of the adjacent portion of the ureters. It is well at this time, however, to separate the bladder in the median line and then laterally past the ureters, if convenient, as this facilitates the isolation of the uterine vessels by the

Fig. 509. The right round ligament has been ligated and the scissors are in place for cutting across it.

The placing of these ligatures on the proximal pedicles, though it takes longer than clamping them, eventually saves time, for forceps here would be in the way and must be replaced by ligatures as soon as the deep work is reached.

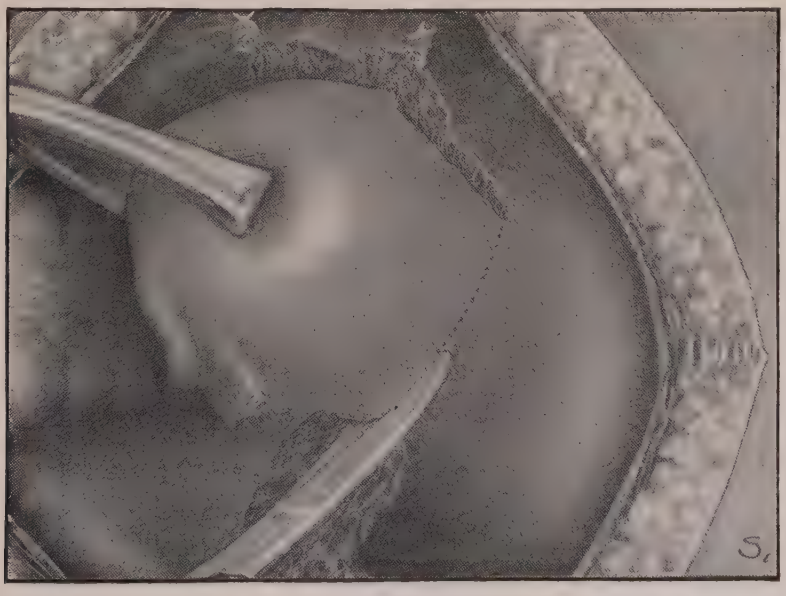


Fig. 510. The upper portion of the broad ligament has been divided on both sides and the peritoneum in front of the uterus is being cut across in the direction indicated by the dotted line.

finger later. When the bladder has been separated as far as practicable at this time, a retractor is introduced to hold it forward (Fig. 512).

5. Freeing the ureters. The uterus is drawn to one side and the ureter located (Fig. 513). The first step in isolating the ureter is to ligate the uterine vessels which lie in the parametrium just above it. This is most conveniently and

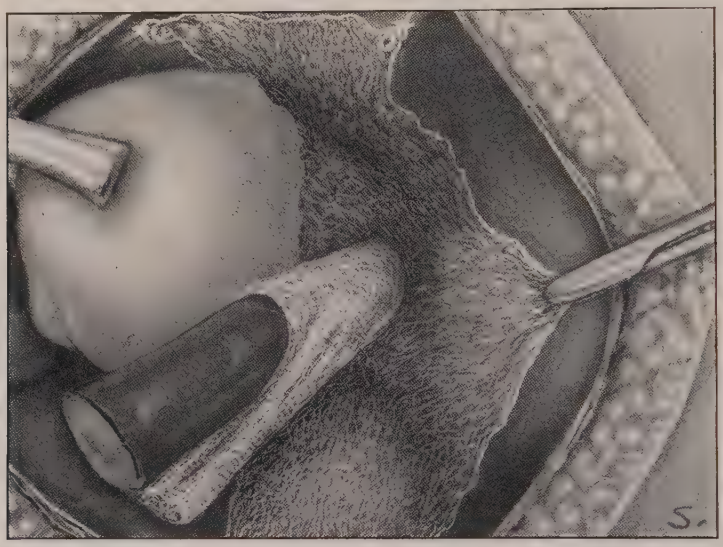


Fig. 511. The bladder is being separated from the uterus with the gauze-covered finger.

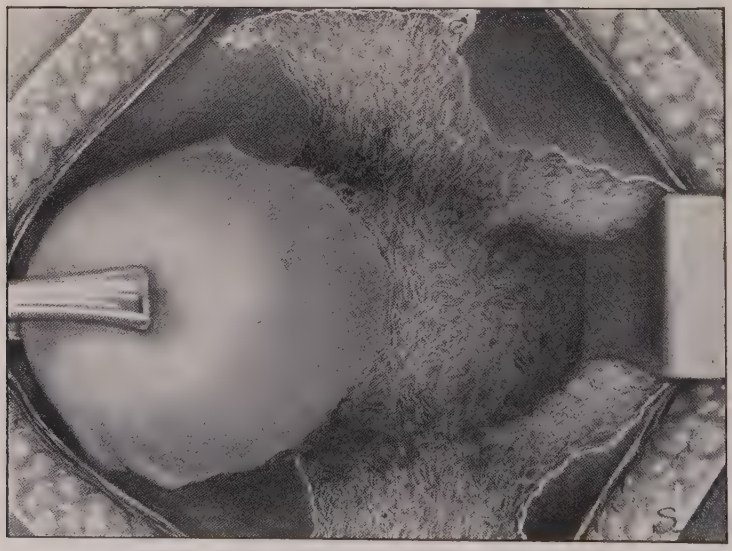


Fig. 512. The bladder has been separated and is being held forward by a retractor. It is well at this stage to carry the separation of the bladder as far laterally on each side as possible without starting undue oozing from the veins. This wide lateral separation of the base of the bladder facilitates the baring of the ureters in the next step.

safely accomplished by introducing the finger along the upper surface of the ureter, from behind forward as shown in Fig. 514. The finger thus introduced has the ureter below it and the uterine vessels above it. A pedicle-needle, carrying a ligature, is then made to follow the finger back as it is withdrawn (Fig. 514), thus carrying the ligature under the uterine vessels. Ordinarily, this isolation is easily accomplished, but sometimes considerable difficulty is experienced.

The identification of the ureter is sometimes difficult. The ureter is sought for between the leaves of the broad ligament and close to the cervix. It can usually be seen behind the parametrium, just before it enters the same (Fig. 513). Lifting the posterior leaf of peritoneum, to which it is attached, aids in bringing it into view (Fig. 515). If still it is not clear to the eye, it may be

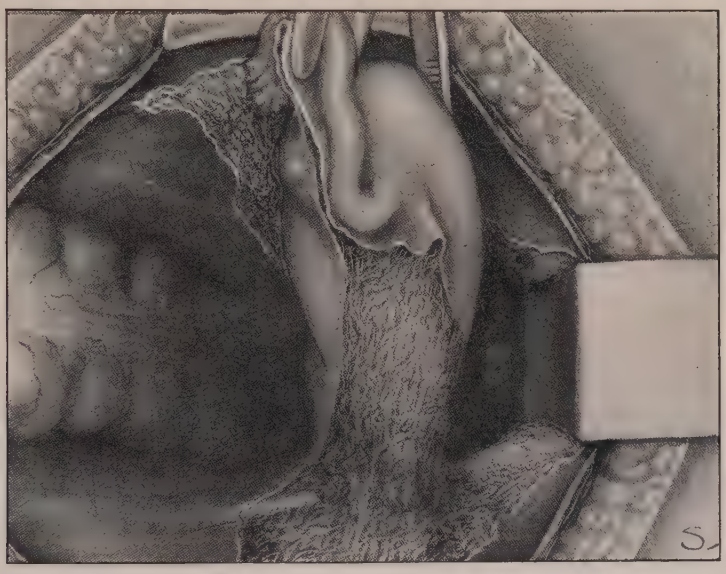


Fig. 513. Locating the right ureter. The ureter can usually be seen entering the posterior portion of the parametrium, as here indicated.

felt, by grasping this portion of peritoneum between the finger and thumb. In certain exceptional cases, particularly in those complicated by the sequelæ of extensive inflammation or previous operation, it may be necessary to identify the ureter higher, as explained later (Figs. 544 and 545), and then trace it to its entrance into the parametrium.

The ureter having been identified, the next difficulty is in causing the finger to follow it through the parametrium. The ureter lies in a potential canal, the posterior extremity of which is marked by a slight arch (Fig. 516), which may usually be distinctly felt by the finger-tip as it is pressed in hard just above the ureter (Fig. 517). Once the end of the finger is well entered in this potential canal (Fig. 518) it may be passed along with but little difficulty, as the tissues separate easily, until the vesical extremity is reached. Here the tissues do not

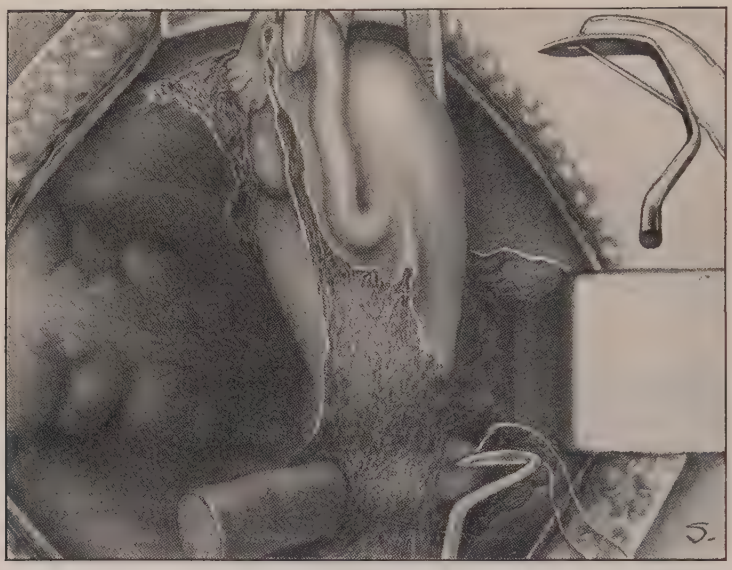


Fig. 514. Introduction of the finger between the ureter and the overlying parametrium containing the uterine vessels. The pedicle-needle, carrying the ligature, is in place ready to be carried through the artificial canal as the finger is withdrawn.

In the corner drawing is shown the details of the pedicle-needle devised by the author, in which the ligature may be easily grasped with the fingers and withdrawn.

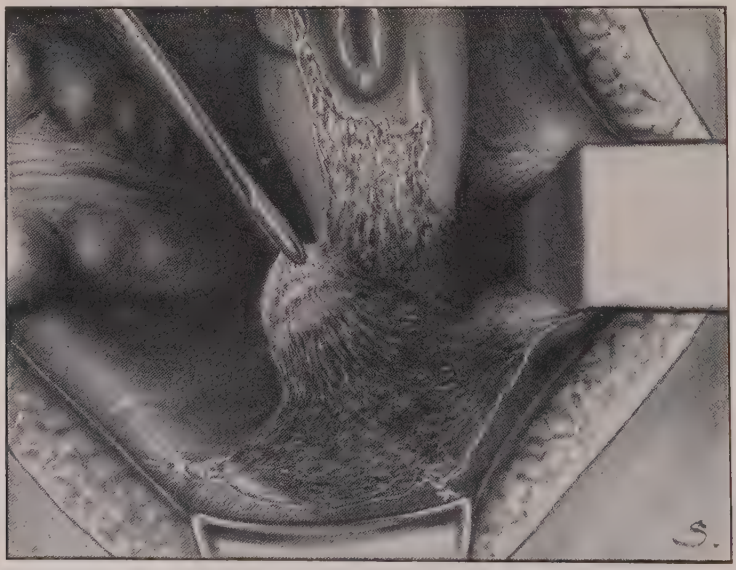


Fig. 515. Identifying the ureter in a difficult case. By grasping the edge of the peritoneum and drawing it up, as here indicated, the ureter can nearly always be identified by sight or touch.

part so easily and there is often some uncertainty as to just where to force the finger-tip through. The point of the finger should be worked through cautiously, the operator in the meantime endeavoring to identify the vesical end of the ureter and the bladder wall. When through, the finger-tip should occupy the position shown in Fig. 519, close to the bladder wall, with the ureter immediately below it.

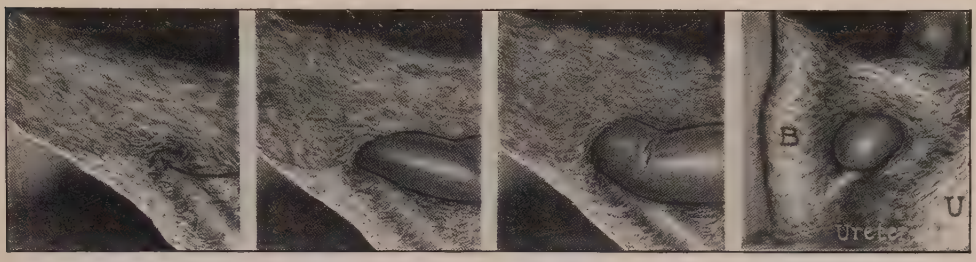


Fig. 516. Fig. 517. Fig. 518. Fig. 519.

Figs. 516, 517, 518 and 519. Details of the isolation of the ureter from the parametrium above it.

Fig. 516. The arch marking the beginning of the potential canal may be seen immediately above the ureter, as indicated by the arrow.

Fig. 517. Forcing the point of the finger into the arch.

Fig. 518. The finger passed some distance along the ureter into the parametrium.

Fig. 519. The tip of the finger appearing at the vesical end of the ureter. The ureter lies immediately below the finger and the parametrium above it. *B* is the bladder and *U* is the uterus (cervical portion).

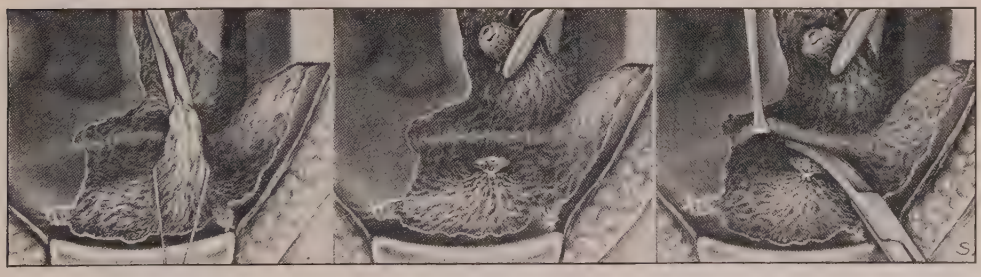


Fig. 520. Fig. 521. Fig. 522.

Fig. 520. The ligature passed between the ureter and overlying parametrium and being carried out so as to ligate the parametrium as far laterally as possible.

Fig. 521. The overlying parametrium ligated and divided, baring the upper surface of the ureter.

Fig. 522. Separating the ureter from the parametrium in which it lies. This step requires particular care to avoid injury to the periureteral sheath, which protects the vascular supply of the ureter, and to the bladder where the ureter enters it.

This step in the work is aided by good separation of the ureteral area of the bladder from the cervix and parametrium, as already mentioned under separation of the bladder.

After the finger is in place, the ligature is introduced by means of the pedicle-needle, which is made to follow the finger on its withdrawal. The ligature is

caught and the pedicle-needle removed. The supraureteral band of parametrium, with the contained vessels, is then drawn toward the uterus with a forceps, while the ligature is worked as far out as possible (Fig. 520) and tied and the vessels divided (Fig. 521).

The superior surface of the ureter is bared by this division of tissue above it (Fig. 521). The ureter is now freed laterally and posteriorly from the parametrium, as indicated in Fig. 522. The separation is most safely accomplished by pushing the ureter off the tissues rather than pushing the tissues off the ureter. Special care is necessary in freeing the vesical end of the ureter. Here it is especially hazardous to hold the ureter and push the tissues from it. The distinction between bladder wall and parametrium is not always clear, and it is very easy to free the ureter into the bladder cavity. This accident happened once to the author. The small rent in the bladder was closed, and it healed without disturbance.

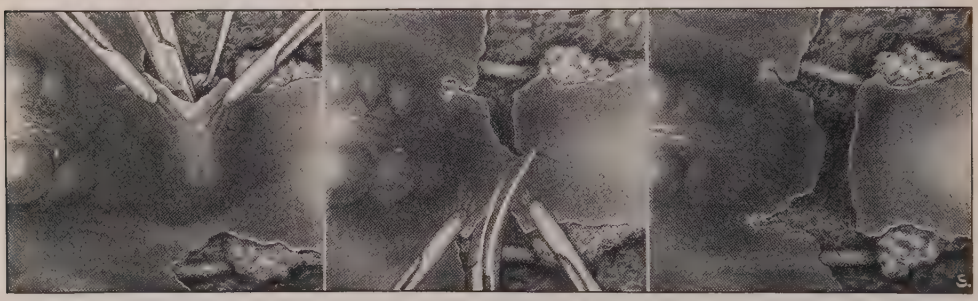


Fig. 523. Fig. 524. Fig. 525.

Figs. 523, 524 and 525. Separating the uterus from the rectum.

Fig. 523. Lifting the culdesac peritoneum from the underlying vascular tissue.

Fig. 524. Dividing the loosened peritoneum of the culdesac.

Fig. 525. The peritoneum divided and the uterus and the upper portion of the vagina separated from the rectum by blunt dissection.

The freeing of the ureters may be extremely difficult when the cancerous infiltration extends to them or around them. Experience has demonstrated that the ureters are rarely invaded by cancer cells, even when entirely surrounded by the growth. Consequently, if they can be freed uninjured, they may be safely left. If a ureter is really invaded by cancer cells, it will be so densely adherent as to preclude satisfactory enucleation. Resection of the involved portion is then necessary, with uretero-vesical or uretero-ureteral anastomosis, as explained later.

After the ureters have been entirely freed, the separation of the bladder is completed. The base of the bladder is separated from the cervix and vagina as far down as necessary. The bladder is carefully separated, also, from the parametrium and paravaginal tissue laterally so as to permit removal of the same.

6. Freeing the cervix posteriorly. The peritoneum of the posterior culdesac is raised from the underlying tissue and divided across, as indicated in Figs.

523, 524 and 525. In this step, care should be taken to divide peritoneum only, as the underlying tissue is vascular and should be clamped before being divided. After division of the culdesac peritoneum, the rectum is separated from the cervix and vagina by dissection with the fingers.

The cancerous cervix is now attached in the pelvis only by the parametrium of each side (including the utero-sacral ligaments) and the vagina. The cervix is freed posteriorly by division of the posterior part of the parametrium forming the utero-sacral ligaments. This tissue may be invaded by cancer cells, hence, as much of it as possible should be removed with the cervix. The ureter is drawn out of the way, the tissue is grasped with a forceps and drawn forward and the ligament is clamped well back beside the rectum (Fig. 526), leaving just

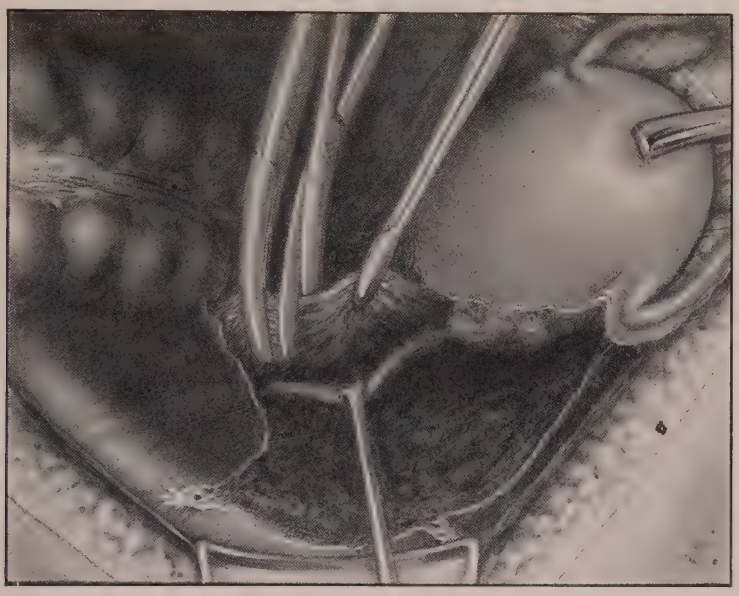


Fig. 526. Dividing the right utero-sacral ligament. It is drawn forward by the anterior forceps and clamped by the posterior forceps, near which it is divided with the scissors.

enough tissue for safe ligation behind the clamp. The clamped tissue is then divided (Fig. 527). This step is carried out on each side, thus freeing the cervix posteriorly.

7. Wide excision of the lateral parametrium. The ease and completeness with which the parametrium may be removed from the pelvic wall varies much in different cases. In some cases the lateral vessels do not come into view, while in other cases the dissection separates the tissues in the plane of the vessels, exposing them as indicated in Fig. 528. In such a case it may be advisable to ligate the uterine artery at its origin, as indicated in Figs. 528 and 529, so as to allow removal of more of the parametrium.

With or without this special ligation of the uterine artery, the parametrial

tissues are carefully loosened and pushed toward the cervix, and then clamped near the pelvic wall, a portion at a time. The aim is to remove the parametrium as completely as possible from the pelvic wall and pelvic floor. The loosening and condensation of the tissues for clamping must be accomplished very carefully and gently. There are many thin-walled veins here which are easily torn through

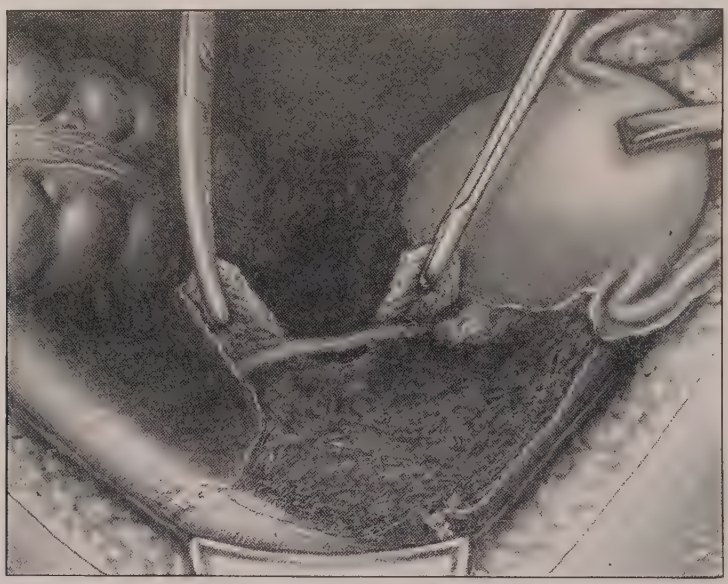


Fig. 527. The right utero-sacral ligament divided.

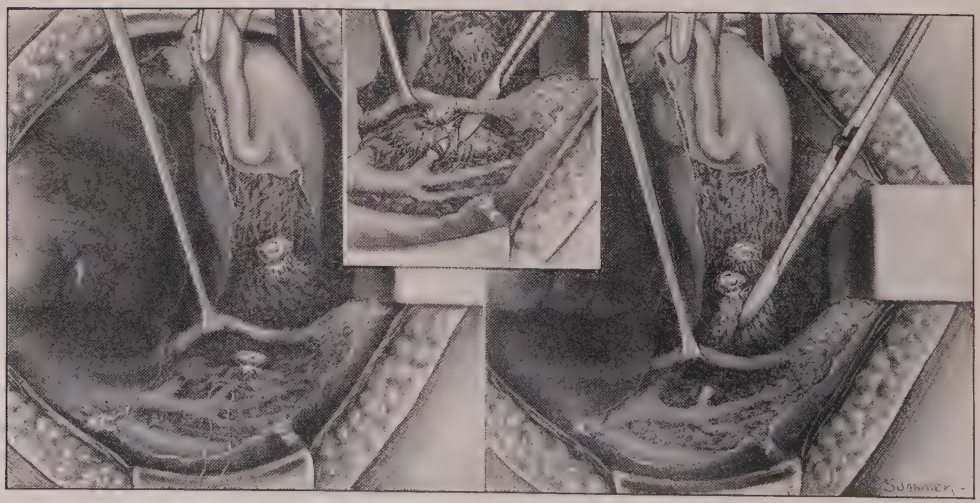


Fig. 528. Fig. 529.

Figs. 528 and 529. A special maneuver for the ligation of the uterine artery at its origin, in suitable cases. An intermediate step is shown in the marginal drawing at the top.

and give rise to serious bleeding which is difficult to control. With the ordinary clamps it was extremely difficult to control bleeding satisfactorily when very wide removal of the parametrium was attempted. To overcome this difficulty, Wertheim devised a long clamp with short curved jaws (Fig. 530). By means of three or four of these parametrial clamps, applied on each side close to the pelvic wall, extensive excision of the parametrium is possible without undue blood-loss. First the upper portion of the remaining parametrium is clamped and divided as indicated in Fig. 531. Then the parametrium is lifted from the pelvic floor, the

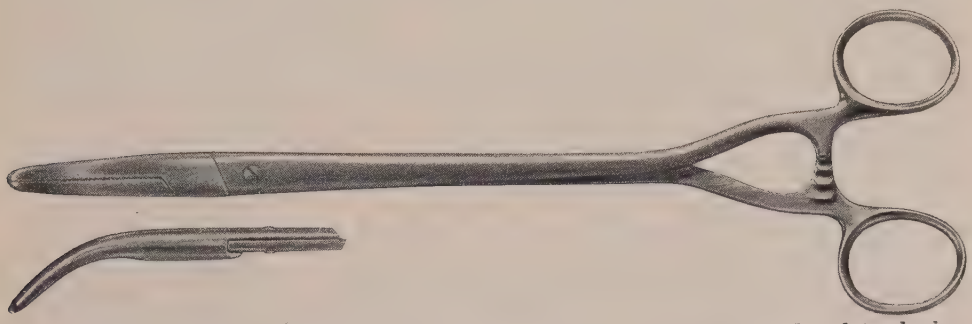


Fig. 530. Wertheim's Parametrial Clamp, showing a front view and a lateral view.

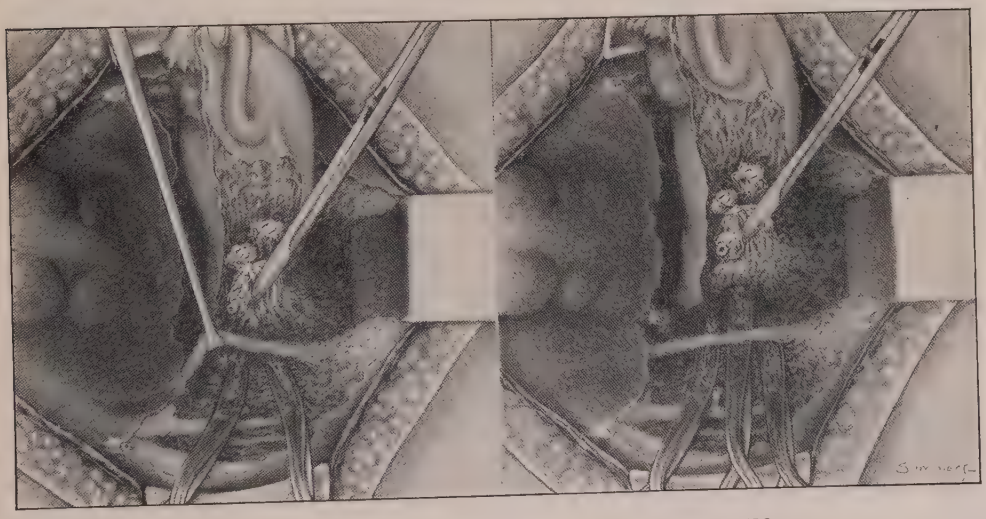


Fig. 531. Fig. 532.

Fig. 531. The middle portion of the right parametrium clamped and divided.
Fig. 532. The lower portion of the right parametrium clamped and divided.

deep veins caught *en masse* with one or two parametrial clamps, and the tissues divided (Fig. 532). The other side is treated in the same way, liberating the uterus except for the vaginal attachment (Fig. 533).

8. *Clamping and cutting across the vagina.* The next step is to determine if the separation of the vagina has been made downward far enough to permit ex-

cision of a cuff of healthy vagina below the carcinomatous infiltration. This is determined by careful palpation of the vaginal wall between the thumb and finger, as shown in Fig. 534. To permit accurate delineation of the margin of the infiltration, the gauze in the vagina must be removed. After any necessary additional separation of the vagina has been made, the vaginal clamps are applied, at

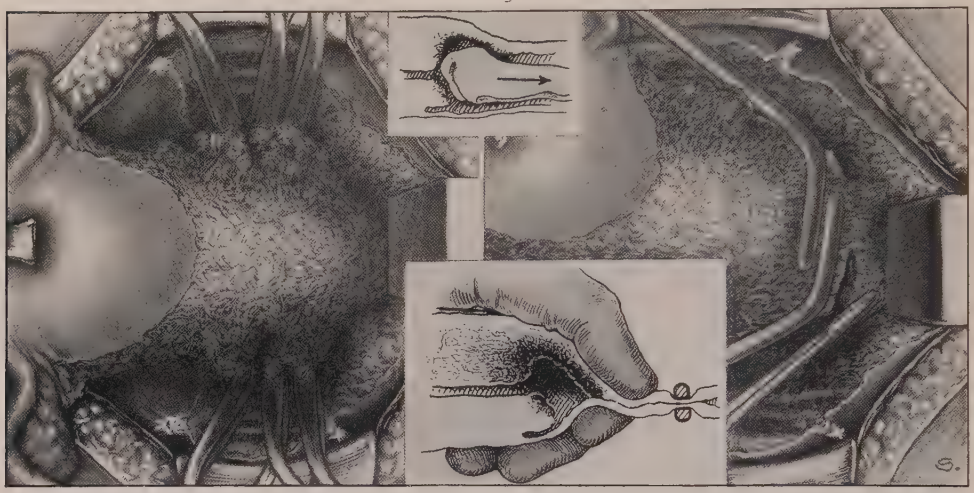


Fig. 533. Fig. 534. Fig. 535.

Fig. 533. The parametrial and paravaginal tissues clamped and divided far out on both sides, freeing the cervix and upper part of the vagina.

The gauze is then removed from the vagina, as indicated in the marginal drawing at the top, and then the separated portion of the vagina is carefully palpated to see if the separation has been carried well past all the infiltrated area.

Fig. 534. Under the guidance of the palpating fingers, the vagina is clamped across about an inch (2.5 cm.) below all palpable infiltration.

Fig. 535. The vagina is clamped from the other side with a clamp which lies just above the first clamp and overlaps it, as here shown. This illustration shows also the beginning of the division across the vagina.

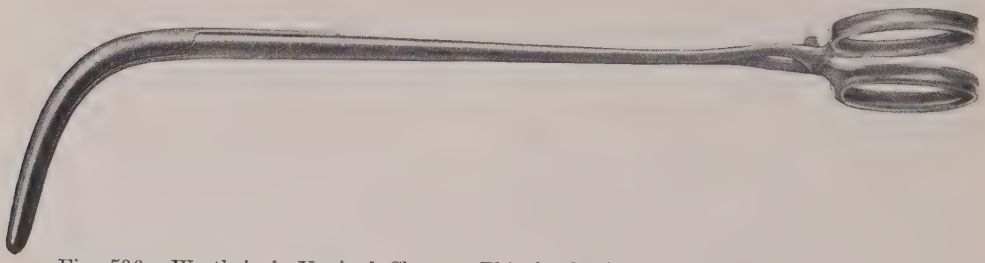


Fig. 536. Wertheim's Vaginal Clamp. This is the improved form, with a curve where the troublesome right-angle was in the old form.

least a finger's breadth below the infiltration, as indicated in Fig. 534. Before applying the clamps, the vagina should be separated sufficiently from the bladder and rectum to give a workable pedicle below the line of excision. As the accurate location of the lower clamp is of most importance, it is well to apply it first.

The clamp on the other side is then applied directly above the first. The clamps should be close together and should overlap for a considerable distance (Fig. 535) so that there is no chance for infective fluid to escape between them during the removal of the mass from the abdomen. The form of the vaginal clamp has a good deal to do with the ease of its application. The first clamps used were

Fig. 537. Fig. 538. Fig. 539.

Figs. 537, 538 and 539. Closing the end of the vagina and placing the drain.

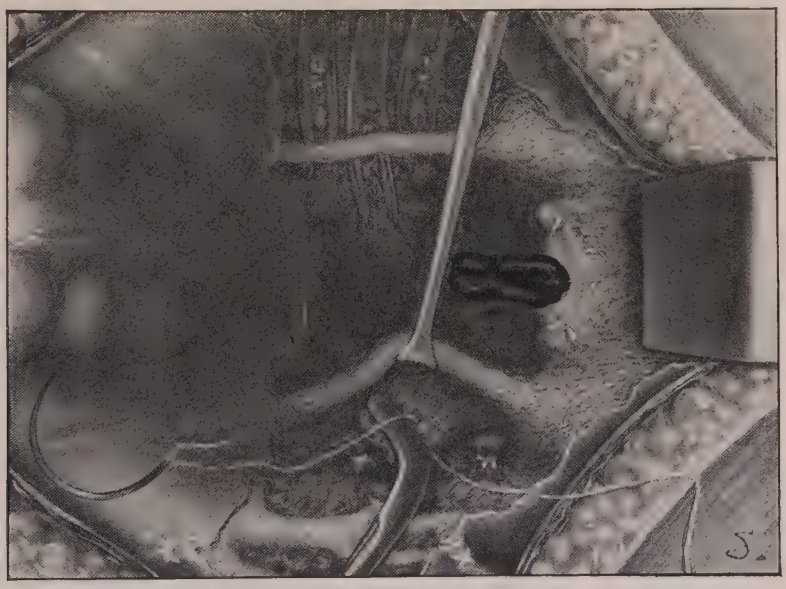


Fig. 540. Ligating the parametrial pedieles on the right side. Two pedicles have been ligated and the ligature is being placed for the third.

right-angled. Later, Wertheim changed the angle to a curve (Fig. 536), which made their application, deep in the pelvis below the cancerous mass, much easier in difficult cases.

It is well to cover the cut end of the excised mass with gauze during its removal. Extra gauze is placed behind the vagina before it is cut across, to protect the tissues from any vaginal fluid that may not have been fully absorbed by the gauze which was kept in the vagina during the operation.

As soon as the cancerous mass is removed, the vaginal stump is disinfected with picric solution. If preferred the division of the vagina may be made with the cautery, though this seems to the author to be a complicating detail which is without corresponding benefit. The cautery sterilizes only the line of incision. In the subsequent closure of the vaginal stump, there is contamination from uncauterized vaginal mucosa, hence some additional method of sterilization must be used anyway. The author prefers to use the picric solution as already described for complete hysterectomy for myoma, introducing the gauze as soon as the vagina is sufficiently opened.

9. Closing the vaginal stump. In apparently clean cases, the vaginal stump may be closed completely or around a drain, as preferred. In infected or doubt-

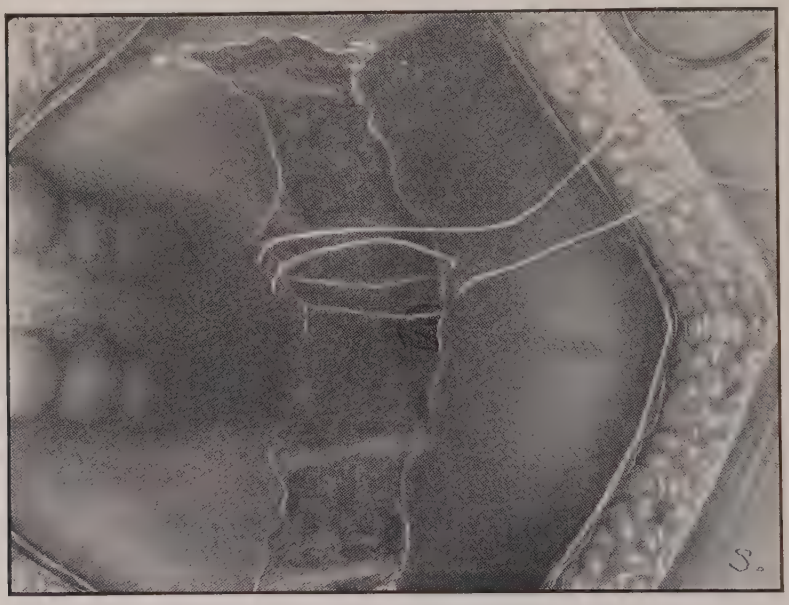


Fig. 541. Bringing together the vesical and rectal peritoneum.

ful cases, a drain or safety vent into the subperitoneal space should be provided. In cases with acute inflammation or extensive contamination of the peritoneum, the drain should of course extend into the peritoneal cavity. A very satisfactory method of treating the stump is to close it around a short drain, as shown in Figs. 537 to 540. Any bleeding point is ligated or caught in a locked suture. The drain may be the end of the iodine gauze or a piece of folded rubber tissue (Figs. 539 and 540).

10. Ligating the parametrial pedicles. The parametrial clamps are released by careful ligation of the tissue held within them. These pedicles are necessarily short and hence the ligatures should be sewed in (Fig. 540) to prevent slipping. In all the manipulations, the ureters should be handled no more than necessary and then very gently. Marked traction or rough handling may damage the

blood supply of the isolated portion. The blood supply of this portion of the ureter comes from the ends and is protected by a close-fitting sheath. With ordinary careful handling, there is little danger of necrosis of the ureter unless the sheath has been damaged in the enucleation. It is astonishing what rough hand-

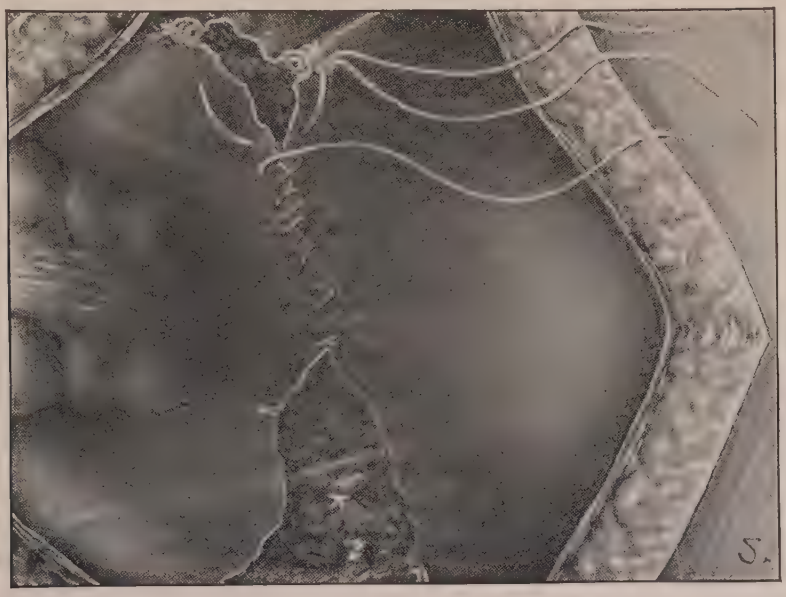


Fig. 542. Approximating the peritoneum laterally.

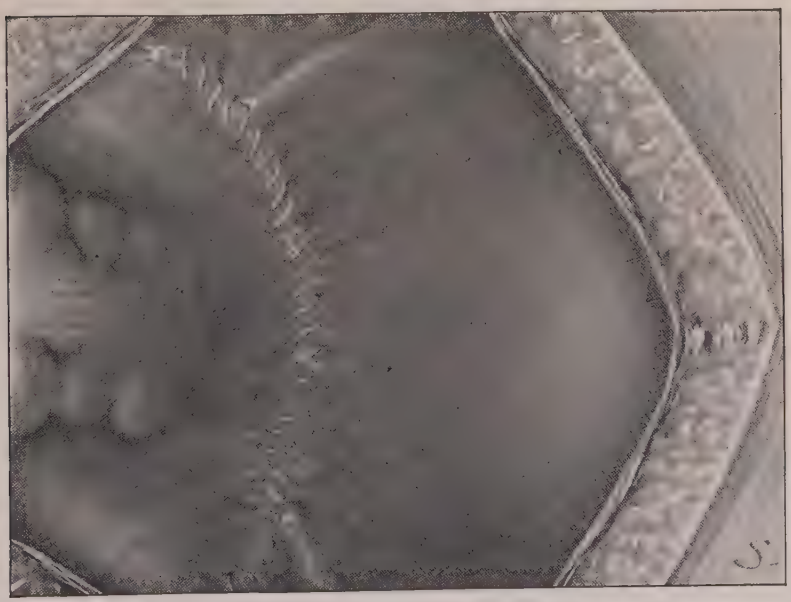


Fig. 543. The peritoneum completely approximated, shutting off the peritoneal cavity from the operation area.

ling and accidental compression some ureters will stand without subsequent trouble.

11. Closing over the peritoneum. After the parametrial pedicles have been ligated and all oozing checked, the operative field is shut off from the general peritoneal cavity by closing over the peritoneum, as indicated in Figs. 541, 542, and 543.

Where it can be accomplished without interfering with the peritoneal closure, it is well to suture the round ligaments to the vaginal stump, to minimize the shortening of the vagina.

If there has been serious infection within the peritoneal cavity, necessitating peritoneal drainage, the vesical peritoneum is sutured to the vaginal stump.

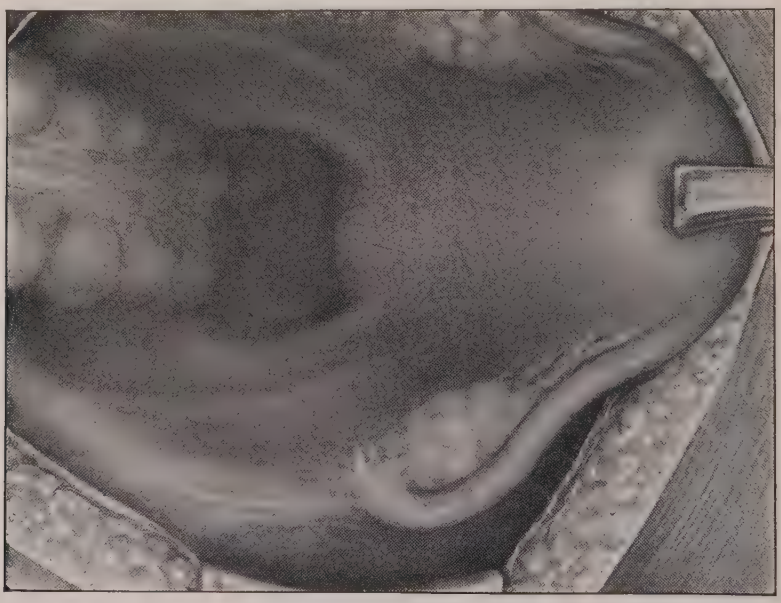


Fig. 544. Preliminary Identification of the Ureters. The uterus has been drawn far forward to expose the pelvic portion of the ureters on each side.

12. Treatment of the bladder. The extensive separation of the bladder wall from surrounding structures leaves that organ impaired in function. Retention of urine is the rule, necessitating catheterization for the first few days. Cystitis has been a very frequent and troublesome complication—so much so that quite an extensive literature has grown up on this feature of the operation. Some operators prefer frequent catheterization while others prefer to use a retention catheter. Whatever the procedure, some cystitis usually appears. That this is not due wholly to bacteria introduced through the urethra, is shown by the fact that it appears in cases in which no catheterization is required. The coincident baring of the rectal and bladder wall is undoubtedly an important factor, tending to favor passage of bacteria through the walls from rectum to bladder.

A mild cystitis, which subsides promptly, is not of great importance. The point is to prevent severe inflammation of the bladder or extension of the inflammation up to the kidneys. As a prophylactic measure, the patient should be given a urinary antiseptic, ordinarily some preparation of hexamethylenamin, for at least a day or two before operation. After operation the bladder may be emptied by catheterization, accompanied with boric acid irrigation, or by a retention catheter, with boric acid irrigation once or twice daily. The author prefers the latter. Though it does not prevent the entrance of bacteria, it prevents the added irritation of retained decomposing urine by keeping the bladder drained, is more comfortable for the patient than frequent catheterization and simplifies

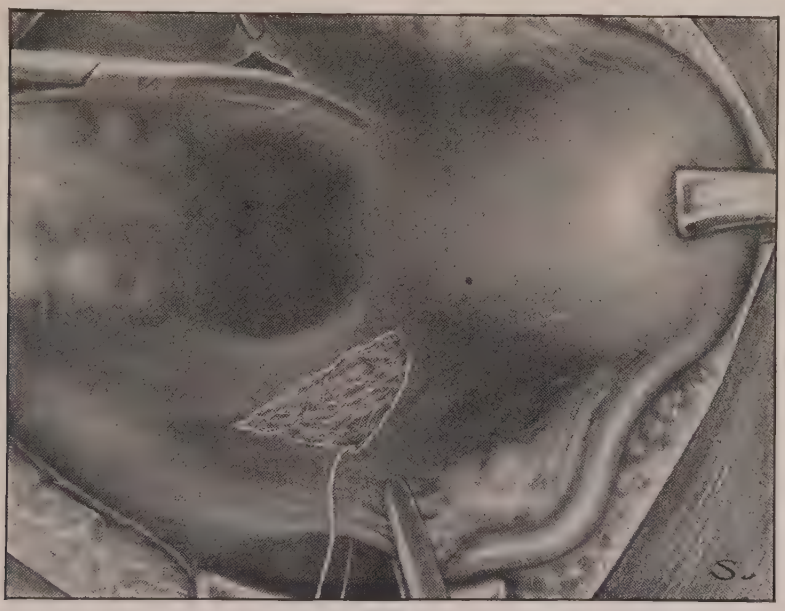


Fig. 545. The peritoneum opened on the right side, exposing the ureter. On the left side the peritoneum over the ureter has been picked up and is being divided.

the after-care. The administration of the urinary antiseptic is resumed as soon after operation as the patient can take it. Through the retention catheter the bladder is washed out with boric acid solution once or twice daily. In three to six days, depending on the bladder condition in the case, the catheter is withdrawn immediately following a boric acid irrigation. Ordinarily the patient can then urinate spontaneously. If not, the retention catheter may be reintroduced for a time, or the patient may be catheterized as necessary after trying, each time, for spontaneous urination.

Variations in technique. There are many minor variations of technique, employed as fancied by different operators. In fact, it is not probable that there are any two independent operators of experience, who execute this extensive op-

eration exactly alike in every detail. The following special points, however, are of sufficient importance to merit separate mention.

Transverse abdominal incision. Some operators prefer the transverse abdominal incision, claiming that it gives better exposure and more room for the deep pelvic work. Whether the incision is longitudinal or transverse is not of great importance and the choice depends largely upon the personal preference of the operator. The advantages and disadvantages of the transverse incision in general, are given in Chapter XV. In the experience of the author, the disadvantages outweigh the advantages. Both Wertheim in his monograph and Sigwart in his monograph, recommend the longitudinal incision.

Primary exposure of the ureters. This was the method first employed by Wertheim, and it is still considered preferable by some operators. As the primary step in the operation, the pelvic portion of each ureter is exposed and identified by means of a slit made in the peritoneum over it. After the operative field is cleared of intestine, the uterus is caught and drawn forward, as shown in Fig. 544. Usually the ureter may then be seen, coursing under the peritoneum of each side (Fig. 545), and the peritoneum over it is raised and opened. If the ureter is not seen, the deeper portion of the peritoneum at the side of the pelvis is picked up and opened by scissors, as indicated in the left side in Fig. 545. This exposes the underlying connective tissue containing the ureter, which may be seen, as in the right side in Fig. 545, or may be easily identified by touch. A ligature is then passed from the peritoneal slit, about the ovarian vessels, as shown in Fig. 545. The ligated tissue is divided and the operator then proceeds in the regular way already described. The advantage of this procedure is that the ureters are more easily found. They are identified in the region where most superficial, and at the beginning of the operation before the tissues have become blood stained. The disadvantage of the procedure is that it bares the ureters to an unnecessary extent and hence increases the chance of injury to their blood supply.

By an experienced operator, the ureter of each side can usually be identified without much difficulty by the regular method (Figs. 513 and 515). If difficulty in identification is experienced, as sometimes happens, especially in cases complicated by pelvic inflammation, this special expedient may be resorted to. In some exceptionally difficult cases it is necessary to go back as far as the pelvic brim to identify the ureter, which is then traced to its entrance into the parametrium.

Removal of lymphatic glands. The distribution of the lymphatics of the uterus is shown in Fig. 546 and the designations of the different gland groups are shown in Fig. 547. These drawings conform to the splendid studies of the uterine lymphatics by Poirer, Cunéo and Marcille.

There are five distinct groups of glands on each side —the external iliac, the hypogastric, the sacral, the common iliac and the aortic. Each of these groups receives lymph, directly or indirectly, from the cervix. The lymph radicles from each half of the cervix uteri converge to the side and form a "lymphatic knot"

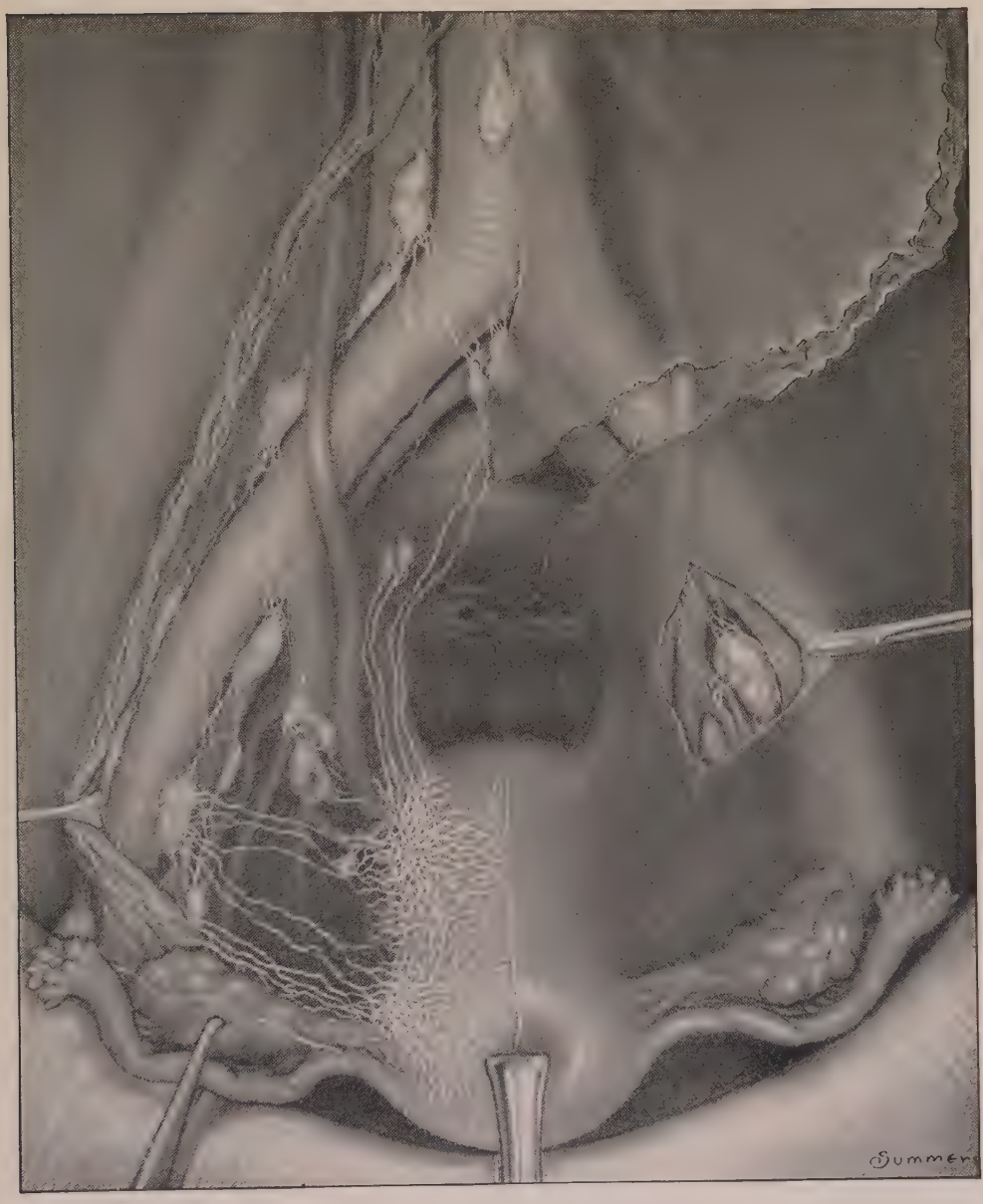


Fig. 546. The Distribution of the Lymphatics of the Uterus.

of interlacing vessels close beside the cervix (Fig. 546). From this lymphatic knot, three groups of vessels pass to the lymphatic glands, as follows: (a) Three or four lymphatic vessels pass from the upper part of the "knot" outward along the uterine vessels above the ureter. After following the uterine artery for a short distance, they leave it and pass outward and upward to the middle chain of the external iliac group of glands. Associated with these vessels, a small

gland is not infrequently found near the ureter (Fig. 546). (b) Two or three vessels pass out from the knot at a lower level. They follow the general course of the uterine artery except that they lie mostly below the ureter. They pass into the hypogastric group of glands (Fig. 546). (c) From the posterior part of the cervical lymphatic knot, three or four vessels pass backward in the utero-sacral ligament around the rectum and end in the sacral glands. The most lateral ones pass to the lateral sacral glands, while the more central ones follow a longer course and end in a central gland which is placed so high that it is des-

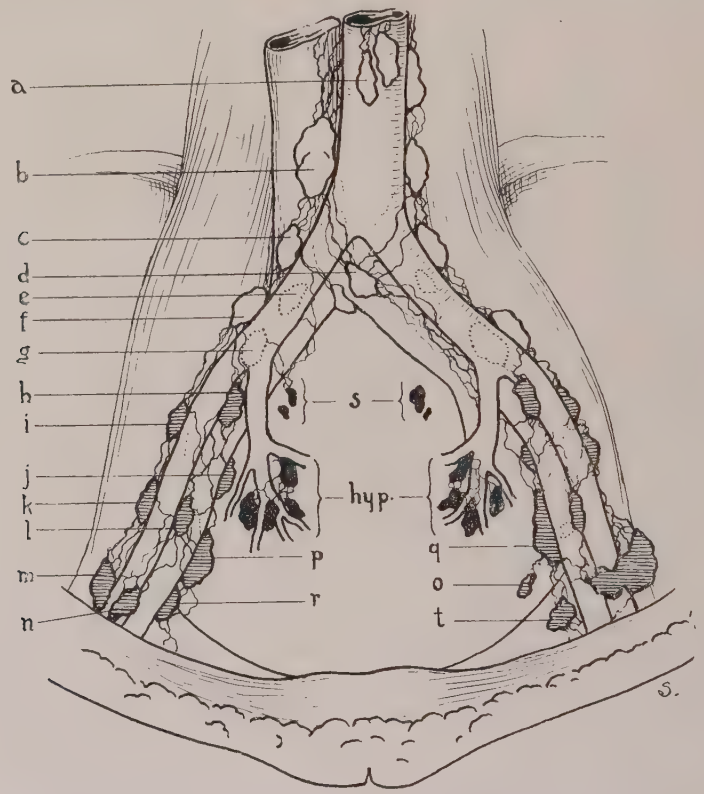


Fig. 547. Diagram showing the location and designation of the various gland-groups: *a*. Pre-aortic glands. *b*. Juxta-aortic or lumbar glands. *c, d, e, f, g*. Common iliac glands. Those indicated by *d* are called also the glands of the promontory, of which there may be one or more. The dotted outlines indicate glands lying under the vessels. *h, i, j, k, l, m, n, p, q, r, t*. External iliac glands. The external chain is indicated by *i, k, m*, the middle chain by *h, l, n*, and the internal chain by *p, r, q, t*. *o*. Obturator gland. *s*. Sacral glands. *hyp*. Hypogastric or internal iliac glands. These glands about the internal iliac vessels are the ones usually first involved in the extension of carcinoma from the cervix uteri.

ignated as the gland promontory (Fig. 546). Through these first-station glands the lymphatics communicate with other groups (Fig. 546) into which the cancer cells may quickly pass. The lymphatics from the upper third of the vagina are distributed in two groups on each side as follows—(a) vessels which pass laterally into the hypogastric glands, and (b) vessels which pass

posteriorly and join with the rectal lymphatics to empty into the sacral glands.

The attempt at complete systematic removal of the pelvic lymphatic glands has been given up, as already explained at the beginning of the chapter and for the reasons there stated. In certain cases, however, it is practicable and advisable to remove one or more groups of enlarged glands, especially the glands of the hypogastric group, which are the ones most likely to be invaded by the cancer. The enucleation must, of course, be made with care, keeping in mind the im-

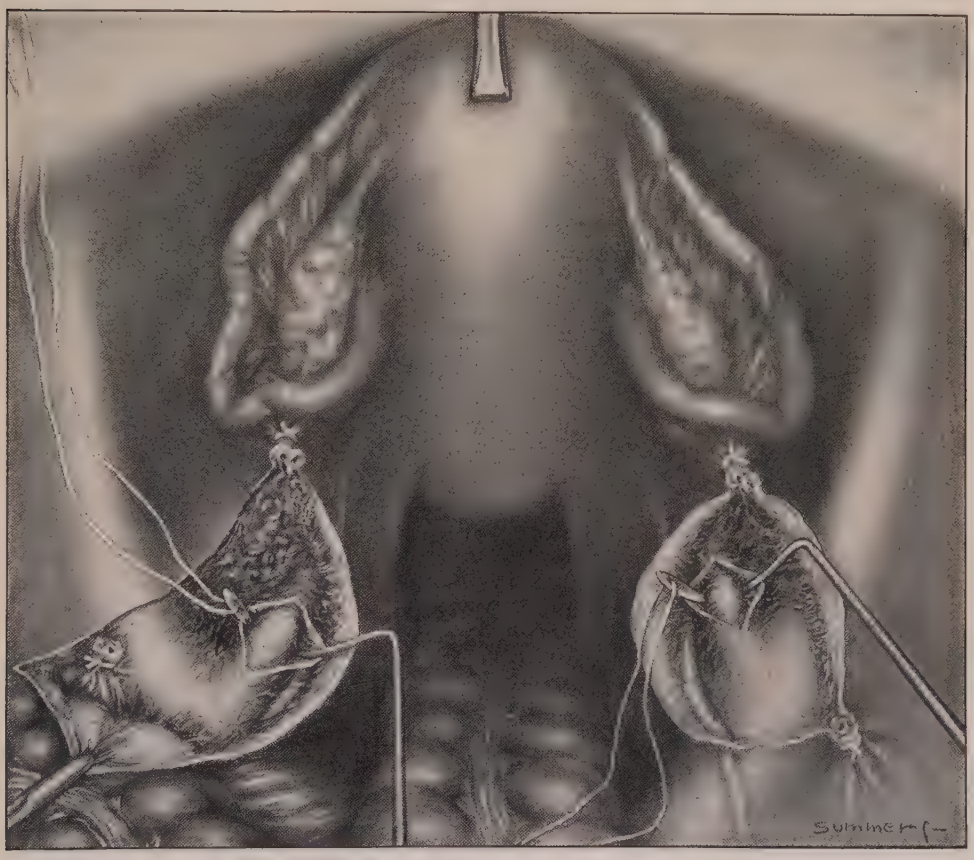


Fig. 548. Ligation of the Internal Iliac Arteries, as a preliminary step in the radical operation for cancer of the cervix uteri.

portant vascular surroundings (Fig. 546). It is conceded that this gland-removal is mostly of prognostic value, but the records show complete recovery in a few cases in which the glands were found invaded by carcinoma.

Another phase of the subject, in which the glands are concerned, is the determination of operability. In those cases in which exploratory abdominal section is necessary to settle the question as to whether or not the malignant disease can be completely removed, the palpation of the pelvic glands is an important part of the pelvic exploration.

Ligation of internal iliac arteries. The details of ligation of the internal iliac (hypogastric) arteries in the radical operation for cancer of the uterus, have been carefully worked out and freely illustrated by Proust and Maurer (Jour. de Chirurgie, 1913, Vol. 11). Used as a special measure, in stout patients, it proved so satisfactory that they adopted it as a routine measure. After the peritoneum and ureter has been pushed inward, the vessel sheath is opened and the pedicle-needle is passed about the artery, with special care to avoid wounding the vein which lies underneath. On the patient's right side the pedicle-needle is best passed from without inward, and on the left side from within outward, as shown in Fig. 548. On the left side the mesosigmoid may need to be raised some, as indicated in the illustration.

In the experience of Proust and Maurer (consisting of eight cases) preliminary ligation of both internal iliacs made the operation drier and facilitated the dissection of the parametrium. But ligation of the uterine arteries and utero-sacral ligaments was required as usual.

Fig. 549.

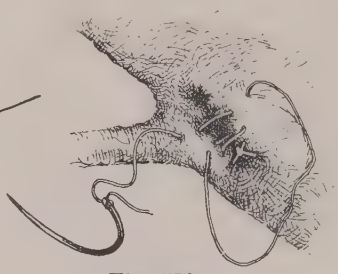


Fig. 550.

Fig. 551.

Fig. 549. Repair of Bladder Injuries. Closing a tear in the bladder near a ureter. A small round-pointed needle and fine linen or silk are used. The needle passes to, but not through, the bladder mucosa. Care must be exercised to avoid the ureter.

Fig. 550. Placing the second row of sutures, which buries the first. This second row of sutures may be of catgut or linen, as preferred.

Fig. 551. The repair of the bladder rent completed.

To diminish the deep bleeding, Wertheim practiced preliminary ligation of the internal iliac arteries from the thirteenth to the twenty-first cases. He then gave it up as it seemed to be of no benefit. The uterine arteries, on being cut, spurted as hard as though no ligatures had been applied. Other operators record the same disappointing experience, while some consider it of very decided benefit. As mentioned later, it is used also as a palliative measure in irremovable cancer, on the principle of the starvation ligature, to lessen the blood supply to the growth and thus diminish its activity.

Repair of bladder wound. Not infrequently the bladder wall is damaged to a greater or less extent in separating it from the cancerous cervix and other structures. Sometimes the injury consists simply of a stripping off of a small portion of the muscular wall. This is repaired by putting in a few sutures which re-ënforce the thin area with the thicker portion of the wall.

More serious is the injury in which the bladder cavity is opened. This, also, usually heals kindly, if accurately repaired. If the opening is small and the condition such that the remaining separation of the bladder can be carried out without further injury, it is advisable to close the opening as soon as made. If, on the other hand, the bladder wall is carcinomatous or so adherent as to be

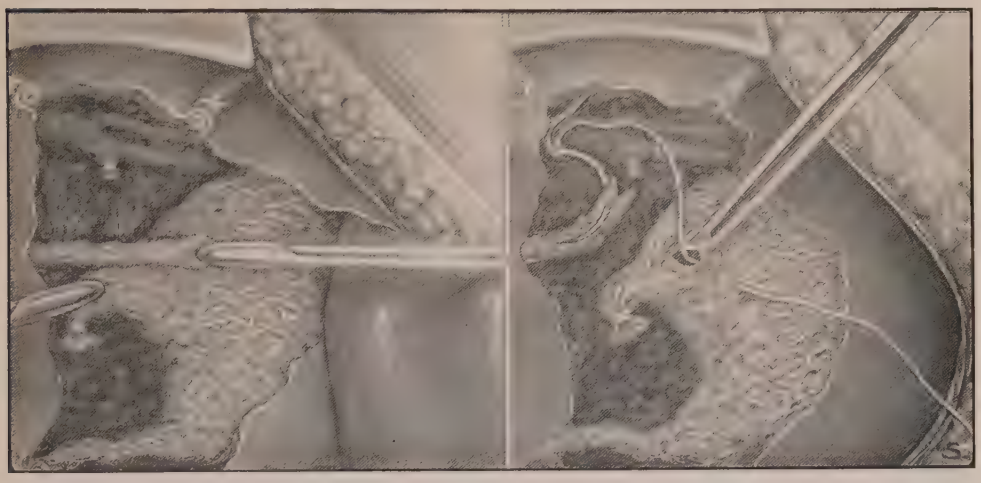


Fig. 552. Fig. 553.

Fig. 552. Uretero-vesical Anastomosis. The bladder has been loosened from the symphysis by the gloved finger, which is still in place. This loosening permits the bladder to be drawn backward so that the shortened ureter may be implanted into it without undue tension. The fact that the ureter is long enough to be brought well into the bladder must be demonstrated, as here indicated, before opening the bladder.

Fig. 553. The bladder has been opened, the end of the ureter bared of its sheath, and the suture for drawing the ureter into the bladder is being passed.

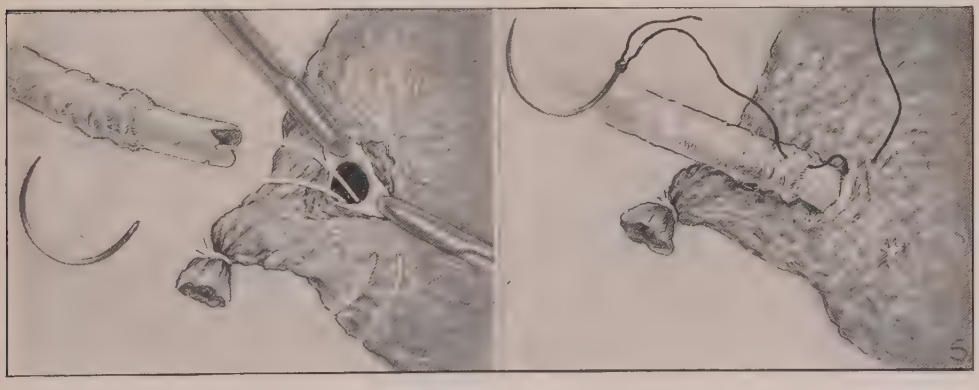


Fig. 554. Fig. 555.

Fig. 554. The suture is in place ready to draw the ureter into the bladder. This suture is preferably of catgut.

Fig. 555. The ureter has been drawn into the bladder and the suture has been tied and cut short. The sheath of the ureter is being sutured to the bladder wall. These fixation-sutures, upon which the success of the implantation depends, should be of linen or silk.

likely to be further torn, it is well to complete the removal of the tumor and then make all the bladder repair at one time. If there is an evident carcinomatous area in the bladder wall, it should of course be excised. Whether the opening be large or small, the principles of its closure are the same. The first row of sutures should be of fine silk or linen, threaded in a small full-curved round-pointed needle. These sutures are preferably interrupted and, taking firm hold of the bladder wall, extend close to the mucosa but not into it (Fig. 549). The reënforcing sutures, which bury the first row, may be of catgut and continuous, as indicated in Figs. 550 and 551. A considerable proportion of these injuries occur near a ureter, and care must be exercised to avoid constriction of the ureter by the sutures. After such repair, the bladder is drained by a retention catheter for five to ten days depending on the extent of the injury.

Uretero-vesical anastomosis. In the deep pelvic work, a ureter may be inadvertently divided or its vitality may be destroyed by being crushed in a clamp

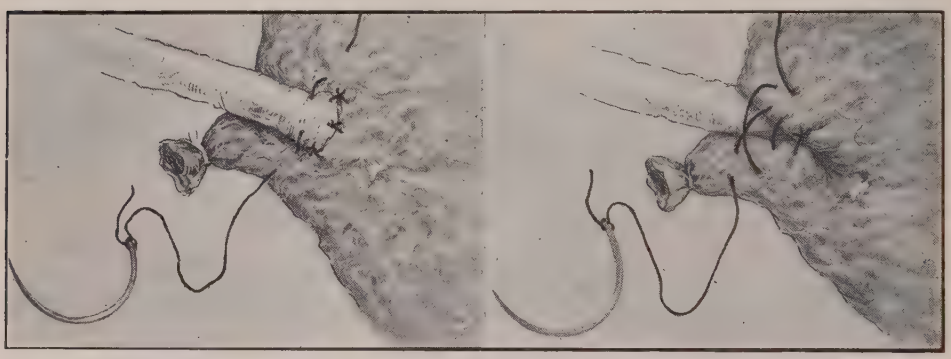


Fig. 556. Fig. 557.

Fig. 556. Overlapping the bladder wall about the implanted ureter, to secure closure of the ureter, as far as possible, as the bladder contracts to expel its contents. The first overlapping suture is in place.

Fig. 557. The overlapping almost completed.

or, in some cases, a portion of the ureter may have to be excised because of undoubted carcinomatous involvement. In any serious injury, involving a cross-section of the ureter or a considerable proportion of a cross-section, uretero-vesical or uretero-ureteral anastomosis is required.

Implantation of the ureter into the bladder is the preferable procedure when the ureter and bladder can be brought together without injurious tension. If the ureter is only a trifle too short, the bladder may be brought to it by loosening that viscus from the pubic bone with a finger introduced as indicated in Fig. 552. When the bladder has been loosened so that the ureter may be drawn past the spot of implantation (Fig. 552) an opening is made in the bladder at the point selected. A catgut suture is introduced through the bladder wall into the cavity and out at the opening, as shown in Fig. 553. This suture then catches the end of the ureter from which the sheath has been pushed back (Figs. 553 and 554)

and is passed back into the opening and out through the bladder wall, as shown in Fig. 554. When this suture is tied, it draws the bared and split end of the ureter (Fig. 554) into the bladder cavity and fastens it there, as shown in Fig. 555. The sheath of the ureter is then sutured securely to the bladder wall with silk or linen sutures. These sutures are interrupted and are placed at intervals about the circumference of the ureter. These sutures go close to the bladder mucosa, but not into it. Fig. 555 shows the method of passing these retaining sutures, while Fig. 556 shows the sutures tied. The union is then reënforced by drawing the bladder wall around with sutures passed as indicated in Figs. 556 and 557. These may be of catgut or nonabsorbable material as preferred.

When the normal bladder contracts to expel the urine, the contraction of the muscular wall closes the end of the ureters so that the urine is not forced back up the ureter. The oblique position of the extremity of the ureters in the muscular wall is probably an important factor in this muscular closure. It is well to

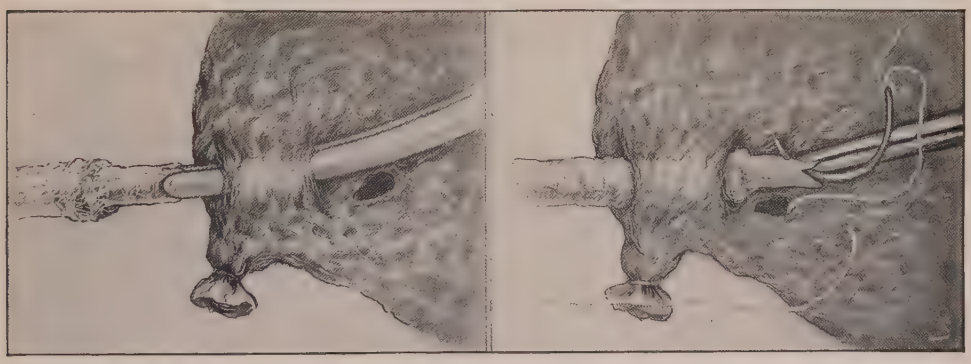


Fig. 558. Fig. 559.

Fig. 558. Another method of securing closure of the implanted ureter as the bladder contracts. The forceps has been introduced under a portion of the muscular wall of the bladder.

Fig. 559. The ureter has been drawn under a portion of the muscular wall, and the implantation of the end of the ureter into the bladder is being carried out as already described.

restore this muscular control, as nearly as possible, in the implanted ureter. This is accomplished by piling up the muscular wall over the ureter as shown in Figs. 556 and 559. Another expedient is to draw the end of the ureter under a portion of the muscular wall, as shown in Figs. 558 and 559. The implantation is then carried out as previously described.

The method of drawing the ureter into the bladder cavity by means of a forceps introduced through the urethra and out at the opening, has been largely superseded. The details of utero-vesical anastomosis by this method are shown in Figs. 560, 561 and 562.

Utero-ureteral anastomosis. When the division in the ureter is too distant for the proximal end to be implanted in the bladder, it may be implanted in the

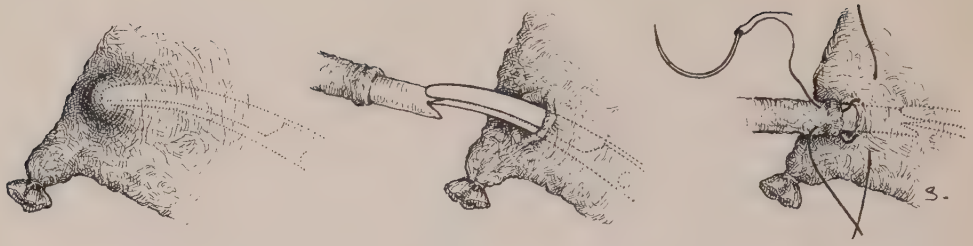


Fig. 560. Fig. 561. Fig. 562.

Figs. 560, 561 and 562. Another Method of uretero-vesical anastomosis. A long curved forceps, introduced into the bladder through the urethra and out through an opening at the site of implantation, is made to grasp the prepared ureter and draw it into the bladder. The fixation of the ureter in the new location is then carried out as already described.

Fig. 560. The forceps in the bladder and pressing out the wall ready for incision.

Fig. 561. The ureter caught with the forceps and ready to be drawn into the bladder.

Fig. 562. The ureter in place. It is being fastened by the method already described.

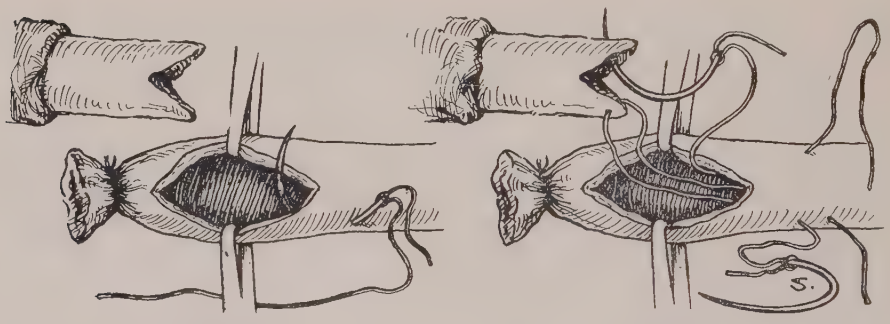


Fig. 563. Fig. 564.

Fig. 563. Uretero-ureteral Anastomosis. The vesical end of the divided ureter has been securely ligated and then opened by a longitudinal incision into which the other end of the ureter is to be drawn. One of the sutures for drawing in the end of the ureter is being passed.

Fig. 564. Placing the sutures for drawing in the prepared end of the ureter.

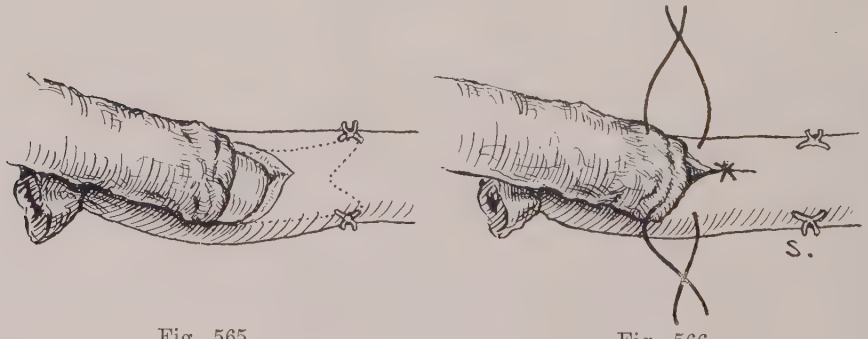


Fig. 565. Fig. 566.

Fig. 565. The kidney-end of the divided ureter implanted into the vesical end.

Fig. 566. Completing the anastomosis by suturing the approximated portions of the ureter securely together with linen or silk.

distal portion of the ureter, beyond the area of injury. The sheath is stripped back from the proximal end, which is slit up for a short distance, as shown in Fig. 563. The divided end of the distal portion is securely ligated, an opening is made into the ureteral cavity below and a catgut suture is introduced, as shown in Fig. 563. This suture takes a firm bite of one side of the proximal end and is then returned into the cavity of the distal portion of the ureter and out through the ureteral wall near the point of entrance (Fig. 564). A suture is then passed on the other side in the same way. When these sutures are tied, they invaginate the upper into the lower portion of the ureter, as shown in Fig. 565. The opening is then closed snugly about the invaginated end, and the sheath of the upper is sutured securely to the sheath of the lower portion, as indicated in Fig. 566.

In all cases of bladder or ureteral repair, a safety vent should be maintained by a small plug left in the end of the vagina, to permit of drainage in case there is leakage of urine. It is advisable, however, that no gauze or other drainage material be allowed to come in immediate contact with the site of repair, as it may interfere with healing and thus cause leakage which would not otherwise occur.

A still more serious problem is presented by those cases in which so much of the ureter has been resected or otherwise invalidated, that neither uretero-vesical nor uretero-ureteral anastomosis is possible. Implantation of the divided ureter in the rectum or sigmoid has proved not advisable. It seems impossible to prevent the uniform and fatal ascending renal infection, when such a ureter is implanted in the intestinal tract. The results have been somewhat better when the vesical orifice of the ureter, or the vesical trigone, were used. But such cases are entirely different from those under consideration, in which the ureter has been severed from its vesical end and, if implanted, will necessarily lack the defensive factors there present.

In these extreme cases, then, the operator is obliged to fall back upon permanent ligation of the ureter or upon temporary fixation of the ureter in the abdominal or pelvic wound, with later nephrectomy. Neither alternative is desirable and it is not altogether clear which is the more undesirable. If forced to a choice, the author would, in the present state of knowledge, choose permanent ligation of the shortened ureter, rather than external fixation with its probable infection and its certain subsequent nephrectomy. In forty-six cases of unilateral ureteral occlusion collected by Barney (Surgery, Gynecology and Obstetrics, September, 1912), ten patients or twenty-one per cent, recovered fully without any symptoms referable to the ureteral occlusion, while most of the others outrode the storms of convalescence, though in several nephrectomy was necessary.

The very extensive operation above described is now seldom, if ever used in its entirety. The improvements in radium work and deep x-ray therapy have been so great that these powerful remedies have largely supplanted radical operation in cancer of the cervix uteri. In all but the very early cases of cancer of the cervix the effective use of radium and x-ray—that is, the use that carries expert skill and judgment, developed through special study and

extensive experience—will accomplish more than can be accomplished with the knife. In the very early cases operation is still advisable. The operation, in these early cases, is to be preceded by a heavy radium treatment and to be followed by deep x-ray therapy, as explained under "choice of radical measures." The operation now employed embraces hysterectomy with the removal of only a moderate amount of parametrium, the width of parametrial removal varying with the conditions presented in the individual case. The idea is to remove the uterus and as much of the parametrium lying close to it, as can be removed without unduly jeopardizing the patient's prompt recovery, keeping in mind that dependence is placed on the radium and x-ray to catch any cancer cells that may have penetrated deeper. The above complete description of the radical operation is retained, for it covers also the steps in the less extensive operations now employed, the operator making the parametrial removal moderate or slight as indicated by the conditions in that patient. This remark applies also to the following description of the radical vaginal operation.

Radical Vaginal Operation.

Along with the development of the extensive abdominal operation for cancer of the cervix uteri, there has gone the development of an extensive vaginal operation, almost if not quite as effective in the essential characteristic of removel of the parametrium. This wide removal of the parametrium from below was made possible, first by the Schuckardt paravaginal incision and, second, by a careful working out of the necessary technique, principally by Schauta. By a few operators the extended vaginal operation is used as the routine measure in preference to abdominal operation, while by quite a number of operators it is used in special cases in which, on account of obesity or cardiac weakness or other condition, the patient is not suitable for the extensive abdominal work. The advantages and disadvantages of the radical vaginal operation will be taken up under "choice of operative method."

The work is executed in the following steps:

1. Disinfection of the vagina and tumor.
2. Closure of the vaginal cuff.
3. Separation of the bladder and determination of operability.
4. Paravaginal incision.
5. Further separation of the bladder and ureters from the cervix and parametrium
6. Ligation of the uterine vessels.
7. Wide excision of the parametrium.
8. Freeing of the upper part of the uterus.
9. Treatment of the pedicles and peritoneal wound.
10. Treatment of the vaginal wound.

1. Disinfection of the vagina and tumor. All the soft tissue is cleared out with the large curet and the remaining bleeding surfaces are sterilized with

picric solution or the cautery. After baking the surfaces with the cautery, apply picric solution freely, working it into all the crevices of the vaginal wall and cervix. A small strip of gauze moistened with the picric solution is packed into the uterine cavity.

The contaminated gloves of the operator and assistants are now changed and the instruments used are laid aside. The prevention of infection from the tumor or vaginal wall is one of the hard problems of the operation. The chance of infection is minimized by the disinfection just described and by the complete change of gloves and instruments at this stage and also following the next step.

2. Closure of the vaginal cuff. The vaginal cuff to be excised is outlined by an incision in the vaginal wall as shown in Fig. 567. A good margin of healthy vaginal wall should be removed with the growth. This outlining circular incision

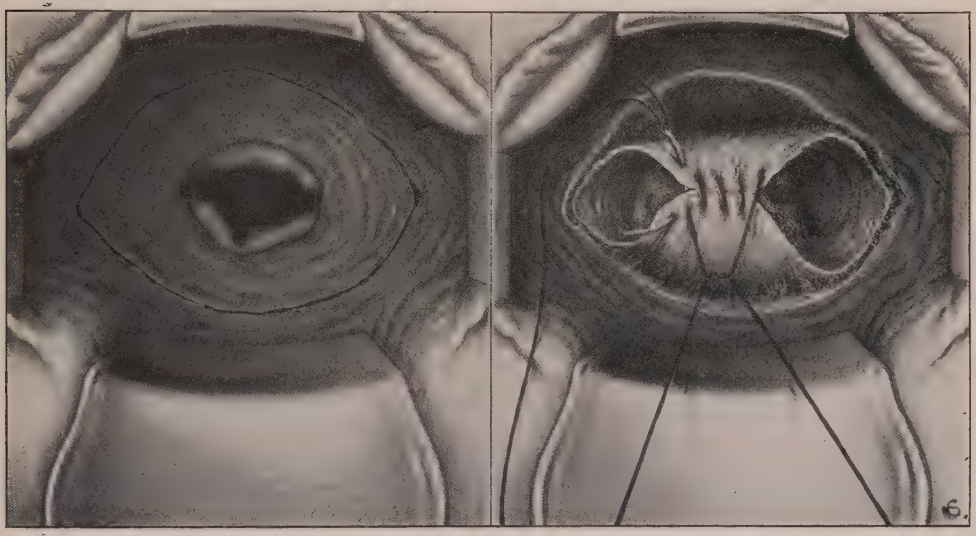


Fig. 567. Fig. 568.

Fig. 567. The Radical Vaginal Operation for Cancer of the Cervix Uteri. The cuff of vaginal wall outlined by incision.

Fig. 568. Raising the cuff of vaginal wall. The central portions of the vaginal cuff have been raised and sutured and the same process is begun on the right side. The iodine-moistened gauze, packed in the cancerous cervix, may be seen behind the partially closed flaps.

is placed, ordinarily, so as to include the upper third of the vagina. In severe cases it is placed at the middle of the vagina, and in exceptional cases with extensive vaginal involvement, it may be necessary to remove the whole vagina, if any operation at all is undertaken.

The delineating incision should be completed before separation of the vaginal wall is begun, for the manipulations of separation cause considerable distortion of the wall. The making of the incision is facilitated by grasping the wall at regular intervals with several long-handled pressure forceps. The incision is then made external to them and they are left on to aid in the separation. It is well

to separate the middle third, front and back, and suture the walls together, as shown in Fig. 568. The heavy silk suture is tied as indicated and left long for traction. Traction on this portion aids in the rapid separation of the lateral portions, which are likewise sutured with heavy silk until the whole cuff is securely closed. All the five or six sutures required are left long for traction (Fig. 569). After the diseased area has been thus completely closed off from the operative field, the soiled gloves are again replaced by fresh ones and the soiled instruments are laid aside. These preliminary steps should be carried out rapidly because much time will be required for the deep pelvic work.

3. Separation of the bladder and determination of operability. The bladder is now separated from the vagina and cervix high up, and a careful exploration

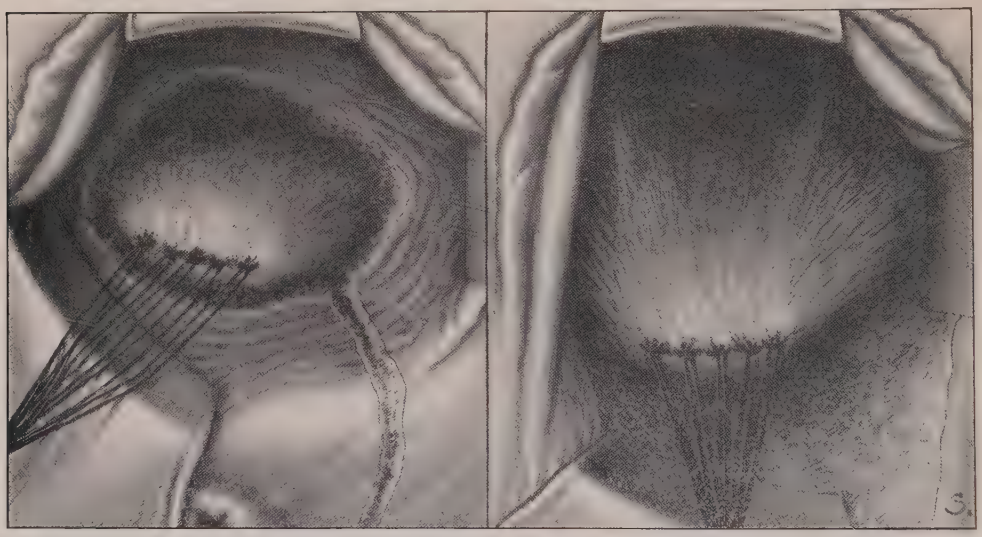


Fig. 569. Fig. 570.

Fig. 569. The vaginal cuff has been completely closed, and the bladder and rectum have been separated from the mass sufficiently to determine that the case is an operable one. The paravaginal incision has been outlined.

Fig. 570. The paravaginal incision has been completed and the parts retracted, and the bladder has been further separated.

is made to determine whether or not the tumor is operable. If the bladder is found to be densely adherent to the tumor, indicating carcinomatous involvement of the bladder wall, the care is not suitable for radical operation. If found thus inoperable, the loosened tissue, (vaginal cuff and part of the cervix) are excised by slow baking with cautery and the thermo-coagulation is extended to the tumor above as in indicated in the particular case.

If the bladder separates easily and the further exploration shows no contra-indication to radical operation, the radical operation is proceeded with by laying open the pelvic floor as described in the next step.

4. Paravaginal incision. The incision through the vaginal wall and pelvic floor is usually made on the left side. The lateral division of tissue is begun at the circular vaginal incision and is curved outward and downward, as indicated in Fig. 569. It cuts the vaginal margin at the lower end of the labium minus. The incision is extended rapidly into the deep pelvic tissues, the cutting edge of the knife being directed slightly outward until the vaginal outlet is reached at the end of the small labium. The knife is then turned downward and the division of tissue extended to the level of the anus and about one inch (2.5 cm.) lateral to it. If this does not give plenty of working space, the incision may be extended farther backward, the posterior part curving somewhat around the rectum, but being kept at all points well away from the rectum and anus.

The incision should be made rapidly and the many bleeding vessels caught promptly with forceps, of which there should be a good supply on hand. The vessels may be ligated at once or the forceps left on as preferred. The minor oozing is checked by pressure. A piece of gauze is placed in the wound and then pressure is supplied by the large perineal retractor (weighed or held by an assistant).

5. Further separation of the bladder and ureters from the cervix and parametrium. The bladder is now pushed upward, being gradually separated from the uterus, after which it is held by a retractor, as indicated in Fig. 570. The bladder is separated laterally, also, from the parametrium of each side. If the infiltration does not involve the ureteral region, the ureter is pushed up with the base of the bladder and may not be found at all in the operative field. If held by infiltration, the ureter cannot go up with the base of the bladder but remains in the field and may become visible, as indicated in Fig. 571, *as the bladder is pulled upward and the uterus and parametrium downward.*

The ureter is then carefully loosened and pushed up out of the way, so that the uterine vessels lying immediately above it can be ligated well away from the uterus. In an experience of more than 250 cases, Schauta did not find catheterization of the ureters required. This separation of the bladder and the ureters from the uterus and parametrium may prove very troublesome, particularly if the operator begins to cut restraining bands here and there. This starts bleeding which requires ligatures, and these constrict the tissues and interfere with the wide separation. The separation up to the uterine vessels should be made entirely by blunt dissection, or as nearly so as possible. There is a plane of cleavage between the bladder and uterus, which if found and followed simplifies the work. This plane of cleavage is most likely to be missed by too great anxiety to avoid wounding the bladder. The operator, in avoiding the bladder, inadvertently works in too close to the uterus. It is better to separate the bladder lightly. In the operation for cancer especially, it is important to stay well away from the uterus, and to roll off the bladder wall only. In that way the bladder separates better and more of the parametrium is left attached to the tumor. If by chance the bladder should be opened, that would be less serious than leaving involved parametrium attached to the bladder.

6. Ligation of the uterine vessels. As the bladder and ureters are gradually pushed upward and the uterus drawn downward, the uterine vessels come within sight or touch when the upper part of the cervix is reached. If there is difficulty in locating the vessels, the anterior peritoneal pouch may be opened widely and one or two fingers introduced above the structures to aid in identification by palpation. If there is still difficulty in locating the structures, some assistance may be gained, in some cases, by opening the posterior culdesac and introducing the fingers back of the broad ligament for palpation.

After the uterine vessels are definitely located and sufficiently isolated, they are ligated as far out as possible (Fig. 571) and divided.

7. Wide excision of the parametrium. The posterior culdesac is opened now (Fig. 572), if it has not been before, and the rectum is separated widely from the

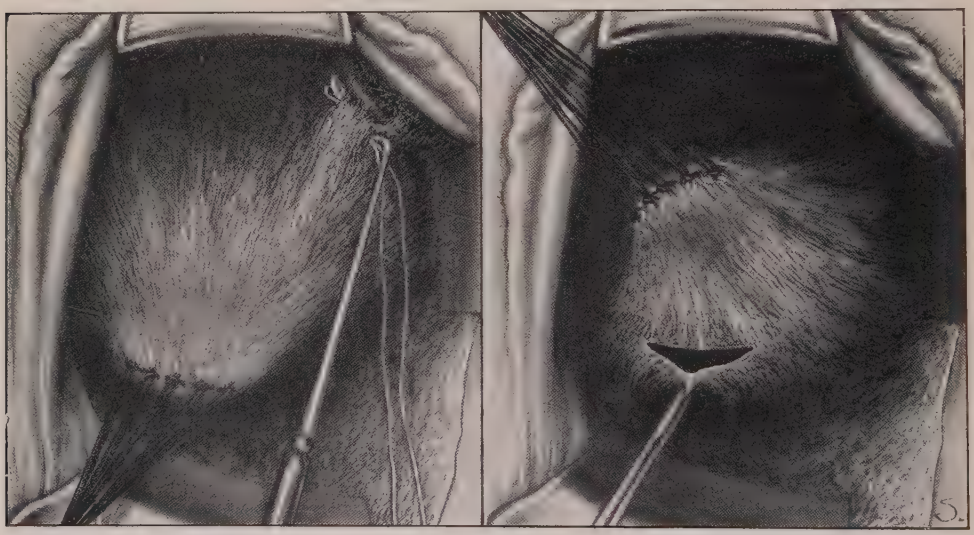


Fig. 571. Fig. 572.

Fig. 571. The left uterine vessels have been located by palpation and are being ligated far out close to the ureter. The ureter may be dimly seen just external to the pedicle-needle.

Fig. 572. The posterior peritoneal culdesac opened, preparatory to wide removal of the parametrium.

cervix and parametrium. The lower part of the uterus remains attached only by the parametrium on each side, which is now divided well out to the pelvic wall. This wide removal of tissue about the tumor includes also the wide removal of the paravaginal tissue about the vaginal vault.

To execute this important step of the operation satisfactorily, the preceding steps must have been thoroughly carried out. The parametrium must be well isolated, with the ureters out of the way, and uterine vessels tied to prevent serious bleeding. The parametrial tissues must be cut from their attachment to the pelvic wall, for they cannot be enucleated to any great extent. Of course, separation

by blunt dissection is carried out as much as possible, but over most of the lateral region there is resisting tissue which must be divided, with consequent bleeding that must be controlled. The bleeding is mostly venous. With the uterine vessels ligated, the arterial bleeding is confined to small vessels, principally the middle hemorrhoidal artery. Schauta depends on packing to control the bleeding, leaving a firm pack on one side while the division of the parametrium is finished on the other side. He objects to ligating the lateral tissues before division because more parametrial tissue would thus be left.

To effect immediate and complete control of the bleeding, in these shocked patients where additional blood-loss may prove serious, and yet secure the greatest possible destruction of parametrium, clamps may be applied as shown in Figs. 573 and 574. The parametrium is pulled away from the side and a for-

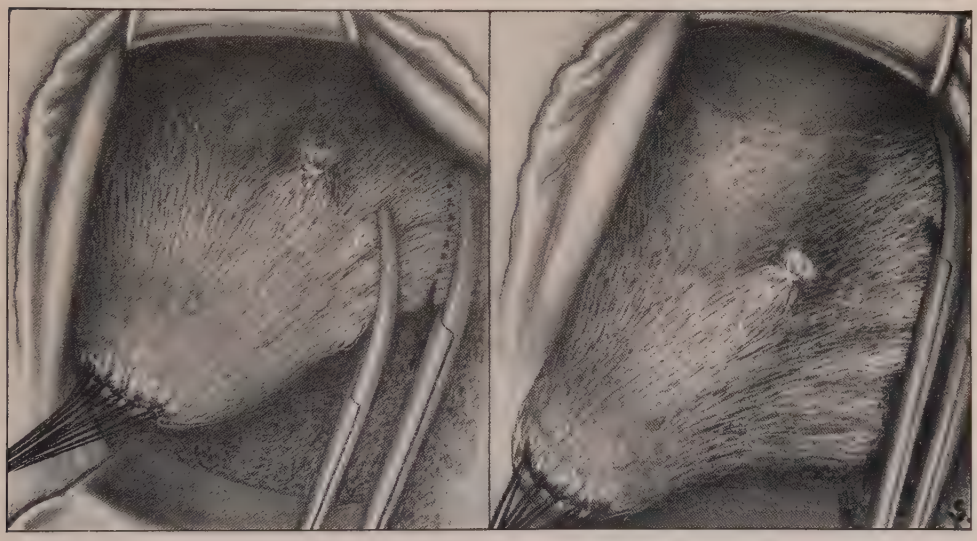


Fig. 573. Fig. 574.

Fig. 573. Clamping the parametrium far out laterally. The outer portion of the parametrium is grasped with a forceps and drawn inward and the clamp is applied still farther out. The place of division is indicated by the dotted line.

Fig. 574. The clamping and division of the parametrium almost completed on the left side.

ceps applied well out. This forceps is drawn inward and the clamp applied beyond it, as indicated in Fig. 573. The tissue is then divided close to the clamp. Another large portion is treated in the same way, and so on until the parametrium is separated on each side to above the cervical region.

8. *Freeing the upper part of the uterus.* The fundus uteri is now brought down and out, the anterior peritoneal pouch being opened widely at this time if it has not been opened before. When the fundus uteri has been brought out, the remaining upper part of each broad ligament is ligated and divided (Fig. 575) leaving the adnexa or removing them as thought best. All the ligatures on the

Fig. 575. Fig. 576.

Fig. 575. The corpus uteri brought down and the left broad ligament being ligated and divided. The tip of the highest parametrial clamp on that side may be seen just under the last ligature. The ligatures on all the ligated pedicles should be left long, to be used in bringing down the pedicles when closing the wound.

Fig. 576. Producing thermo-coagulation of the parametrial tissue held in the clamps.

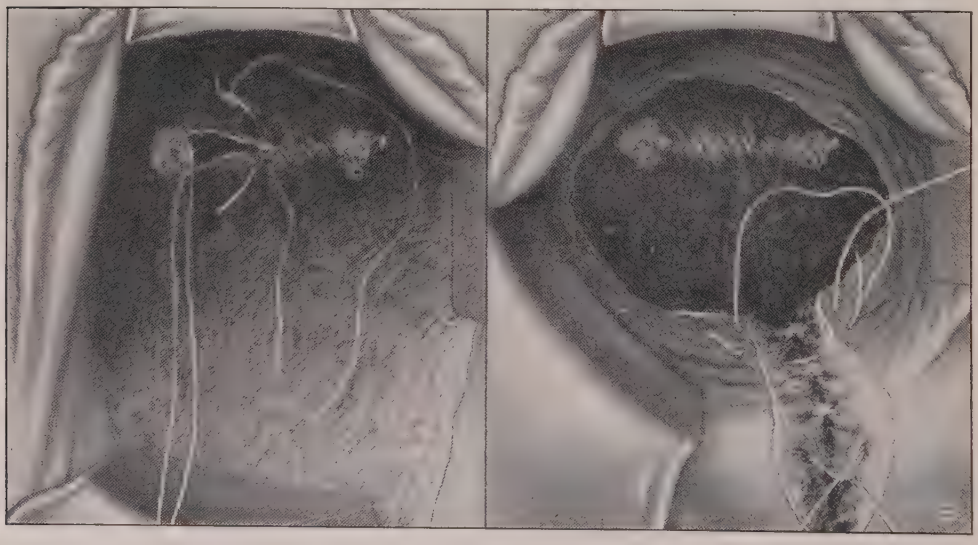


Fig. 577. Fig. 578.

Fig. 577. The upper broad-ligament pedicles (the ligated pedicles) have been brought down and the peritoneal cavity is being closed above them.

Fig. 578. Closure of the paravaginal incision. The deep portion of the incision has been closed and the suture is in place for beginning the closure of the superficial portion.

broad-ligament pedicles are left long, and are used later to bring the pedicles down as the peritoneal wound is being closed. The convenience of the long ligature attached to each high pedicle, can be fully appreciated only by those who have cut the ligatures short and then had the experience of fishing unsuccessfully for the retracted pedicle at the close of the operation. After removal of the uterus, the field is carefully examined and all bleeding points ligated.

9. Treatment of the pedicles and the peritoneal wound. If clamps have been used laterally, they may be left on, in which case the tissues within their grasp will slough. If preferred, and the patient's condition will permit, time may be taken to use the cautery on the clamped pedicles, as indicated in Fig. 576. The heat should be applied long enough to secure complete thermo-coagulation of the tissues within the grasp of the clamps, after which the clamps may be at once removed.

The anterior and posterior layers of peritoneum are sutured together, the pedicles with long ligatures attached being brought down and fastened in the angles, as shown in Fig. 577. The ligatures are then cut short.

10. Treatment of the vaginal wound. The deep portion of the vaginoperineal wound is closed by buried sutures, and the superficial portion by a continuous suture, as indicated in Fig. 578. Unless 40-day catgut is used, it is well to introduce reënforcing sutures of silkworm-gut deeply from the perineal surface.

Palliative Measures.

Radium, when used effectively, stops the bleeding and melts away the carcinomatous mass in a most remarkable way. In the author's experience it has gone far ahead of any other palliative measure in temporarily checking the disease and permitting restoration of the patient's strength. In conjunction with the newer x-ray therapy, to reach the deeper portions of the growth, the period of improvement may be much prolonged. However, there is an occasional case that does not respond to treatment. This is true of all palliative measures used in cancer of the uterus. The proportion of cases that do not respond is, I think, less with radium treatment than with any other form of treatment, but these few cases are very striking because they contrast so greatly and so disappointingly with the usual course. Cancers of the uterus differ greatly in their pathological structure and growth, and no doubt these differences have a bearing on their reaction to treatment. In certain cases the uterine cancer is complicated by extensive inflammation and these cases may do badly under any method of treatment, including radium.

When radium or the high-powered x-ray is not available, recourse may be had to one of the older palliative measures as follows:

Curettage and sealing of lymph spaces.
Cautery excision of the cervix.
Heat treatment under guidance of hand in abdomen.

Curettage and Sealing of Lymph Spaces. An incision through carcinomatous tissue carries cancer cells into the incised lymph spaces. Consequently the incision should be promptly followed by some application that will at once kill these transplanted cancer cells and seal the lymph vessels beyond. This is a general principle of work in known or suspected malignant tissue. It applies to diagnostic curettage for suspected cancer of corpus or cervix, to excision of tissue from the cervix and to the various palliative operations necessitating division of tissue within the involved area. Without this effective sealing of lymph channels, every incision or curet-wound in cancerous tissue promotes spread of cancer cells and constitutes a serious menace.

The destruction of cancer cells on the curetted surface and the sealing of the lymph spaces may be accomplished by the cautery or by carbolic acid or by acetone.

Curettage. The excochleation or clearing out of the soft papillary bleeding tissue is best accomplished with a large spoon curet with sharp edges. The papillary masses should be cleared out rapidly down to firm tissue and then the cautery or other sealing device applied. The bleeding, which is free at first, diminishes as the softened tissue is cleared away to the firm base and is checked entirely by the searing of the surfaces. Of course, care must be exercised that the curet does not break into the bladder or rectum. When the bladder or rectal wall is apparently involved, extreme care must be taken to curet very lightly here and to avoid deep cauterization. A vesico-vaginal or recto-vaginal fistula adds much to the patient's discomfort. Though it may form spontaneously later, it should be avoided as long as possible.

Cauterization. This is a most effective method of checking oozing, destroying cancer cells and sealing lymph channels, on the raw surface left by excochleation. It is important, however, that the cautery should not be too hot. The surface should be baked rather than burned, as the desired effects are thus better secured, both on the surface and beneath the surface. For this purpose a cautery that will hold low heat for some time is necessary, and also the vaginal walls should be well protected from the prolonged heat, preferably by a water-cooled speculum. The Percy cautery and water-cooled speculum (Figs. 585 and 586) are the most satisfactory instruments for this work that have come to the notice of the author. The cauterization can be made by the smaller cauteries (Paquelin and small electrics) but their small size and method of construction make it impossible to maintain a moderate heat very long in contact with the tissues. Consequently they must be withdrawn and reapplied very frequently, and as a rule they are applied too hot and quickly become too cool, hence there is but little baking effect.

After the cauterization, the charred cavity is packed with a small strip of iodoform gauze. This should just fill the cavity without projecting into the vagina. Packed in firmly, it adheres to the walls of the cavity and remains there until the slough of destroyed tissue separates, which is in five to seven days.

Some plain or antiseptic gauze is packed lightly in the vagina. This may be removed in one or two days and the antiseptic vaginal douches given. The small piece of iodoform gauze in the cancerous cavity is not disturbed. When the slough separates, the slough and gauze come away together. That leaves a granulating surface, which is treated with antiseptic douches and, if desired, astringent applications.

It is surprising what marked improvement will at times follow this cautery treatment. The bleeding is entirely checked, and a healthy granulating surface forms and heals and contracts. The mass becomes reduced in size and more movable. The patient's general health improves and she is certain she is getting well. This improvement may continue for several weeks or for several months or even for a year or more. Sooner or later, however, there is local or distant renewal of growth. If the renewal of growth is local, and particularly if accompanied by bleeding, a repetition of the treatment may be advisable.

Unfortunately the marked relief mentioned above does not always follow this treatment. The result of this, as of other forms of palliative treatment, differs greatly in different patients. In some the improvement is marked, in others only moderate and in others very slight, while there is an occasional case in which the growth seems to progress more rapidly after any interference or palliative treatment. It is difficult to predict in any particular case, what the result of the treatment will be, though, in a general way, the younger the patient the more refractory the growth is to treatment. These remarks as to the uncertainty of the reaction apply to all palliative measures, from simple astringent applications to the most extensive palliative operation.

Carbolic acid application. After all soft tissue has been cleared away with the large curet, the firm surface remaining is dried and then cauterized by repeated application of pure liquid carbolic acid, the vaginal wall being protected by cotton pledgets squeezed out of alcohol and packed about the cervix. After the raw surface is thoroughly seared, the carbolic acid is neutralized by alcohol.

Acetone Application. After the excochleation and checking of hemorrhage, the patient's pelvis is elevated and a cylindrical speculum is introduced. This cylindrical speculum should be of such size that, when pressed firmly against the cervix, it will permit the acetone to reach all parts of the curetted surface, but will not permit any to escape and come in contact with the vaginal wall. Before the speculum is introduced the interior of the vagina is coated with vaseline, so that, if any acetone should escape, the burning or irritation from it will be minimized. When the patient's pelvis is elevated and the cylindrical speculum in place, the pure acetone is poured in from a bottle. Ordinarily the speculum is filled about one-third full. This is kept in place from twenty to forty minutes. The anesthetic may be withdrawn as it is not needed for the acetone treatment, provided the patient will keep quiet. After the acetone has been in place about fifteen minutes, it is well to introduce a small piece of cotton held in forceps and work it around over the surface. This loosens coagulated shreds and

flakes that may interfere with penetration, and also brings fresh acetone in contact with the surface. It is well to limit the first application of acetone to twenty or thirty minutes, the longer application being reserved for later, when it has been determined that the patient has no idiosyncrasy to the drug. When ready to remove the acetone, the pelvis may be lowered and the acetone allowed to run out of the speculum. The author has found it more convenient to remove the acetone by soaking it up with small cotton balls. If improvement follows, it may be enhanced by subsequent applications of acetone, made once or twice weekly, for a month and then at longer intervals.

The acetone treatment was devised by Gellhorn. The author has found it very helpful in some cases, though in general he prefers to follow the excochleation

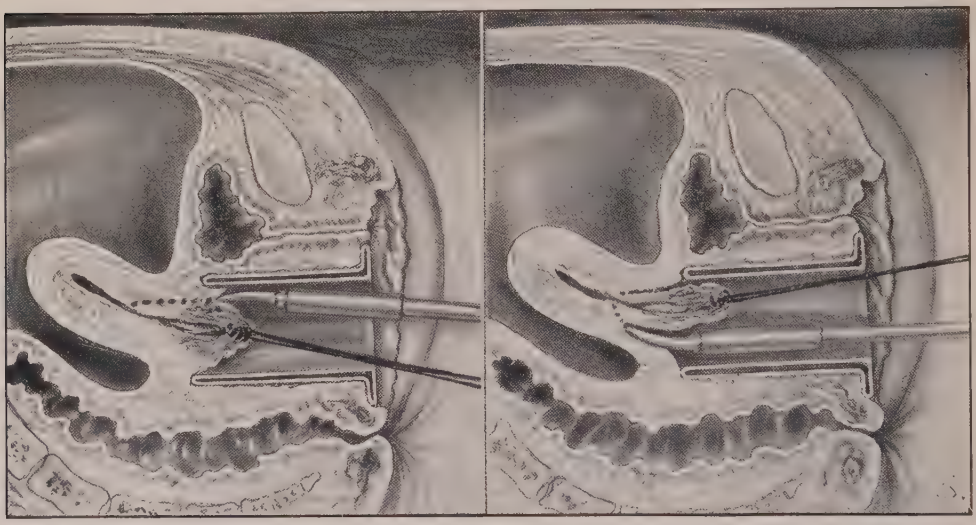


Fig. 579. Fig. 580.

Figs. 579 and 580. Cautery-excision of the cancerous cervix under low heat (Byrne method).

with the thorough baking with the cautery. In the ordinary aceone treatment, without excochleation, no anesthesia is necessary, and this is quite an advantage in certain cases.

Cautery Excision of Cervix (Byrne). The remarkable results obtained by Byrne, results far superior to any secured by the knife in those days, were due to the wide area of thermo-coagulation he secured and the selective heat action which extended beyond. Not only was a large part of the cervix excised (Figs. 579 to 580) but the cancer cells were killed in the surrounding tissue to a considerable depth. This thermo-coagulation over a wide area was attained by use of low heat applied a long time. It was the baking process already referred to. As indicated in Figs. 579 and 580, it is conveniently carried out by the Percy cautery and water-cooled speculum.

Fig. 581. Heat treatment of the cancerous area under the guidance of a hand in the peritoneal cavity (Percy method).

The tissues are to be compressed about the cautery by the fingers of the hand in the abdomen. Only a portion of the involved area can be thus compressed at one time, hence the involved tissue must be gone over systematically and the various portions compressed against the cautery to insure effective heat penetration.

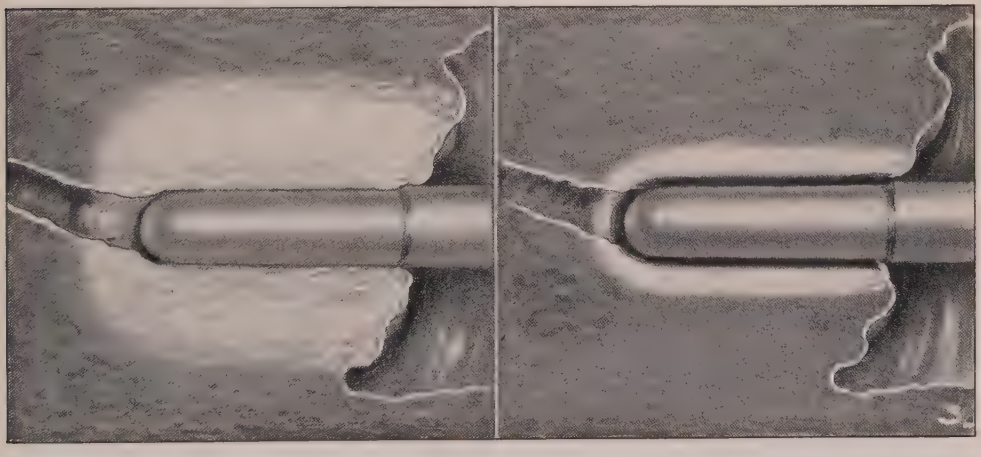


Fig. 582. Fig. 583.

Fig. 582. Indicating the wide area of heat diffusion secured by keeping the cautery-point below a charring temperature.

Fig. 583. Indicating the limitation of heat diffusion when the cautery-point is hot enough to produce a charred zone.

The cervix may be closed with strong silk sutures which are left long for traction, or the cervix may be grasped with a strong tenaculum-forceps. Byrne used an internal tenaculum-forceps which he pushed into the canal and caught in the interior of the cervix.

Heat Treatment under guidance of hand in abdomen. This extension of the Byrne baking process was worked out by Percy (Surgery, Gynecology and Obstetrics, September, 1913). The idea is to extend the heat treatment throughout the main cancerous mass, even to its peripheral portions, the application of the heat to the different portions being guided and graduated by touch by means of the hand in the abdomen (Fig. 581). In the region of influence there are three zones, showing different effects of the heat. Immediately against the cautery there is a zone of black charred tissue. Beyond this is a zone of complete thermo-coagulation which later sloughs along with the charred area. Still beyond is an area in which the heat kills the poorly organized cancer cells but does not kill the more stable tissue cells. In this last zone there is no sloughing of masses of tissue, but simply disintegration and disappearance, more or less com-

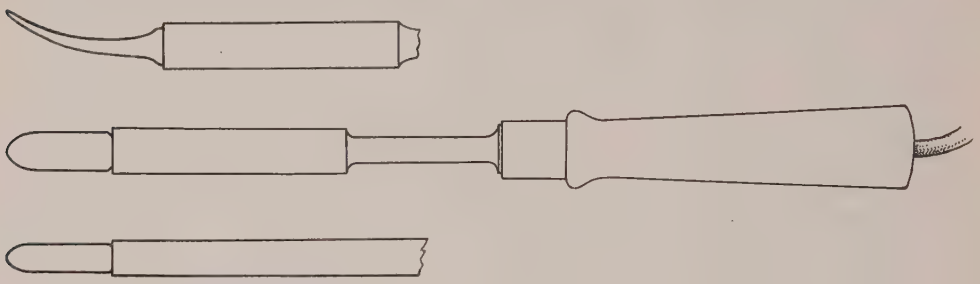


Fig. 584. The Percy Cautery, showing the Points usually employed.

plete, of the cancer cell. It is this selective action in the outer zone that makes heat effective for a considerable distance beyond the line of excision and beyond the limits of the mass removed in the subsequent sloughing. It is this selective action only that can be safely extended to the affected visceral walls surrounding the cancerous mass—that is, to the rectal wall, to the bladder wall and to the ureteral walls. It is important to make this zone of selective action as wide as possible, so that the surrounding visceral walls may be freed of cancer cells without destructive sloughing and fistula formation. In this connection there are three factors which require consideration: (a) the degree of heat required in this zone of selective action, (b) the attainment of this heat throughout a wide zone, and (c) the measuring or determination of this heat in the visceral walls. The determination of the heat present is important on the one hand to insure sufficient heat to kill the cancer cells and on the other hand to prevent an excessive amount that would cause complete thermo-coagulation with subsequent sloughing and fistula.

The degree of heat required in the selective zone. This has been estimated to be 110° to 115° F. (43° to 46° C.) maintained for about twenty minutes. The

degree of heat required no doubt varies considerably in different cases, with the character of the growth and the quality of the surrounding tissues.

The attainment of selective heat. Through a wide zone this is attained by the application of low heat for a long period. Herein lies the essential difference between cauterization and heat treatment. A cautery, hot enough to rapidly sever the tissues, burns the tissues immediately about to a charred mass. This zone of charred tissue acts as a protective blanket about the cautery, preventing the heat from penetrating widely into the surrounding tissues. Percy experimented on this point by holding the cautery in blocks of meat, the cautery being at different degrees of heat in different experiments and being held in place for different periods of time. He found that the widest penetration of heat was secured by keeping the cautery below charring heat, as indicated in Fig. 582.

When the cautery was hot enough to immediately char the tissues, this charred zone limited the penetration of the heat as indicated in Fig. 583. As previously explained the cautery must be of a kind that will hold a moderate

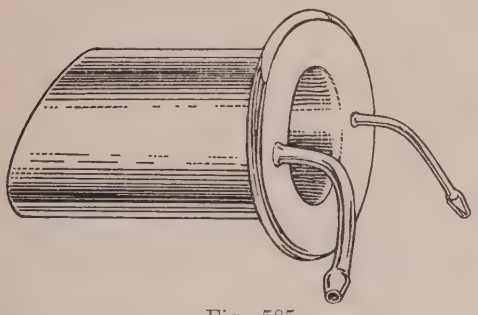


Fig. 585.

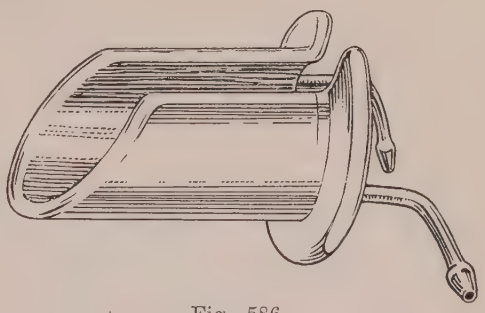


Fig. 586.

Figs. 585 and 586. Percy's Water-cooled Vaginal Specula.

Fig. 585. The regular speculum. Notice that the tube through which the cool water flows out of the speculum is smaller than that through which the water flows in, thus making it possible to keep the water chamber entirely full.

Fig. 586. A special speculum, designed to permit the application of the cautery along the anterior vaginal wall.

heat for a long time. The Percy instruments, shown in Figs. 584 to 586, have proved very satisfactory. The cautery point may be tested as to heat on a piece of soft wood. If it chars the wood it is hot enough to char the tissues and should be reduced before introduction. As already mentioned, the duration of the heat is important. It takes time to heat the tissues, for it must be applied slowly with a minimum of charring. And then the heat must be maintained for fifteen to twenty minutes. Furthermore, it cannot be maintained at a maximum at all points at the same time, but successive portions of the mass are brought under the full influence of the cautery, by being pressed toward it by the abdominal fingers. Consequently the treatment requires long anesthesia with its usual hazards.

The determination of the heat present in the outlying portions of the mass. This is determined principally by the abdominal fingers as they hold successive portions of the mass firmly about the cautery (Fig. 581). As the heat gradually penetrates the intervening tissues, the fingers feel it more and more. When the heat is just short of decided discomfort, as appreciated by the glove-covered fingers, the temperature is ordinarily about 110° F. This was determined by placing a thermometer between the fingers and the rectal wall when the finger was making the same kind of pressure per rectum. When the heat becomes decidedly uncomfortable to the gloved fingers pressed firmly against the mass, it indicates that the temperature is in the neighborhood of 115° F., which should not be long

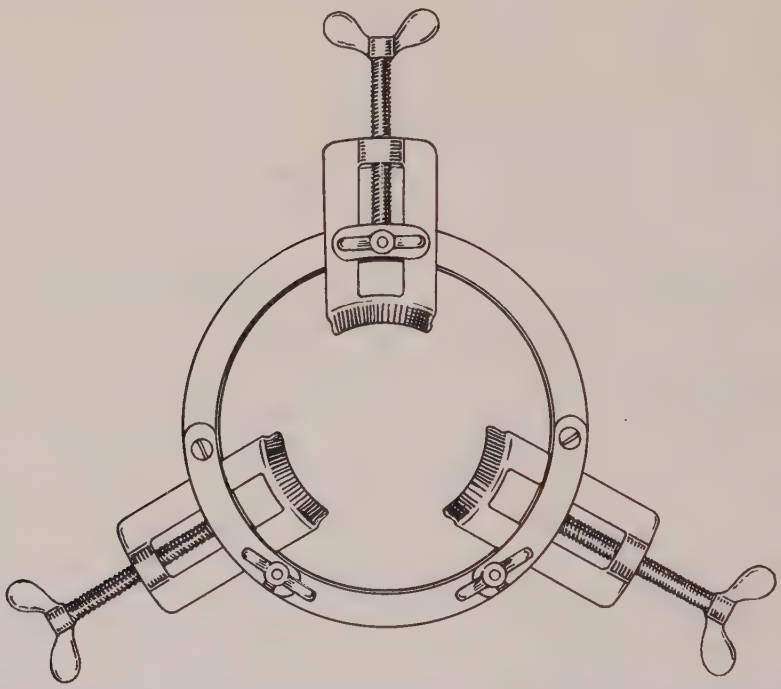


Fig. 587. Percy's Vaginal Dilator. A powerful dilator for producing the wide dilatation necessary for the water-cooled speculum.

maintained. This is of course a rather uncertain method of heat estimation, but seems to be the most practicable one for use in this situation. In the rectum and in the bladder heat regulation by thermometer has been attempted but has not proved very satisfactory. In estimating the heat by the gloved fingers the fingers are not simply laid on the tissues but the area being treated is grasped firmly and pressed against the cautery. This gives better penetration of the heat and at the same time gives more prompt and accurate appreciation of the temperature in the tissues under the fingers.

In the execution of the heat treatment, the patient is given the regular preparation for abdominal section. After anesthesia, the abdomen is opened, the

intestines packed out of the way and adnexal adhesions broken so that the fingers may grasp and accurately palpate the different portions of the mass (Fig. 581). If for any reason the mass cannot be accurately palpated, the case is not one for the extensive heat treatment.

There is much of promise in the heat treatment, but there is also much that is unknown or uncertain. Splendid pioneer work has been done by Percy, but still there is comparatively little definite, accurate, demonstrable knowledge about any one of the three factors. This is not surprising when we consider the complex conditions in the pelvis and particularly the great variations in different individuals—in the character of the growth, in the vitality and resistance of the surrounding tissues, and in the associated inflammation or other complicating conditions. This uncertainty should not prevent use and development of the method; but it bespeaks care and judgment and caution in the application in the individual cases, that benefit and not harm may result.

Selection of Treatment.

The choice between radium, x-ray, and the knife in the treatment of uterine cancer, as in the treatment of myoma, presents much confusion at present. This is due to two factors. The first is the newness and incompleteness of the knowledge concerning radium and x-ray therapy. The information concerning them is coming in so rapidly that a considerable part of it is still undigested, as far as sustaining clinical practice is concerned. Some opinions are evidently based on enthusiastic hopes rather than on tested evidence. The second factor is that many of the radical pronouncements as to treatment are by workers familiar with only one or two of the measures under consideration.

The three measures mentioned, rightly used according to present knowledge, are not antagonistic or exclusive one of the other. Rather they are supplementary. Each has its field in which it is clearly the best treatment. The edges of the fields merge, of course, giving classes of cases in which the choice is not strongly one way or the other.

Radium.

In the advanced inoperable cases and in the borderline cases, radium is our most effective remedy. The palliative effect is nothing short of wonderful. The enlarged carcinomatous cervix with its bleeding papillary masses melts away as by magic, and the cavity closes, largely or entirely by healthy granulation. However, this beneficent effect is limited in extent and diminishes rapidly with the distance from the radium. The cancer cells are killed in the area in which all tissue is devitalized and also in the next zone in which the effect is sufficient to kill the cancer cells but not the tissue cells. It is from this latter zone that the cancer-free granulations come which lead to healing of the cavity. Beyond this is a third zone in which the cancer cells

are partially devitalized, and eventually are killed through connective tissue growth and pressure starvation. Beyond this is a fourth zone in which the cancer cells are not harmed—in fact, may be stimulated to more rapid growth.

The problem of radium treatment in carcinoma of the cervix uteri is the problem of widening the second zone so that it extends to the pelvic wall. This is a difficult problem and is still unsolved, though progress is being made. By the use of large doses of radium the second zone may be pushed far out toward the pelvic wall, but the first zone, the zone of complete devitalization, is also widened, with resulting serious sloughing affecting the bladder, ureters, and rectum. By heavy screening, the first zone may be limited and the second zone greatly widened, theoretically even to the pelvic wall. But there then appears another harmful effect quite as serious if not more so than sloughing and fistula formation, and that other effect is extensive connective tissue contraction, or fibrosis, which develops gradually in certain cases after radium treatment. This leads to gradual constriction of nerves, with persistent pain, and gradual stenosis of the rectum, ending in occlusion. Several cases have been reported in which colostomy was required.

So radium is two-edged—it cuts both ways and may do much harm as well as much good. Consequently its use requires decided caution. It is hoped that in time the curative effects of radium may be extended to the limits of the pelvis, but that ideal has not yet been attained. In some extensive cases the cancer is completely eradicated by the radium; however, this result is attained in only a small proportion of the cases. It may be hoped for, but it is so infrequent in the classes of cases under consideration that the remedy must be presented to the patient as essentially a palliative measure, with only a possibility of cure. As mentioned later, it is advisable to employ also deep x-ray therapy, to affect the cancer cells lying beyond the effective reach of the radium. But even this combination must still be classed generally as palliative rather than curative.

X-Ray.

In carcinoma of the uterus the function of x-ray treatment is to devitalize the outlying cancer cells, i.e., the metastatic growths and the outer portions of the main growths which may be beyond effective reach of the radium applied within. In other words, deep x-ray therapy in cancer of the uterus is supplementary to radium and to operation. The question of metastasis is always present in these cases of cancer. Even in the earliest operable cases we cannot be certain there are no metastases. Hence the plan of treatment should include all reasonable measures for devitalizing outlying cancer cells. Here lies the field of x-ray treatment in carcinoma of the uterus. Recent advances in deep x-ray therapy have increased very much the retarding effects in these deep growths and encourage the hope that curative effects may ultimately be attained.

The Knife.

In early operable cases, that is, in those early cases apparently still confined to the uterus, I feel that immediate removal of the uterus and adjacent tissue likely to be involved, is the safest plan. Theoretically we should be able to cure these patients with radium with as great certainty and with far less danger than with the knife. But so far the actual results in cancer of the uterus do not justify displacement of the knife by radium in these early cases.

In something over one thousand reported cases of carcinoma of the cervix treated by radium five years previous to the reports, about 20 per cent were cured—approximately the same percentage as by radical operation. This large series of reported cases was collected by Dr. F. J. Taussig in an excellent review (Am. Jour. Obst. and Gynec., December, 1920). When the cases were divided into classes it was found that more of the advanced and borderline cases were cured by radium than by operation, while of the early operable cases the percentage of cures by radium (31 per cent) fell decidedly below that by operation (40 to 45 per cent). It is hoped that advance in the technique of radium treatment will eventually place it far ahead of operation in percentage of cures even in these early cases, but that result has not yet been demonstrated.

There is still uncertainty as to how far radium will be effective in a particular case. It gives wonderful results in some cases but in others it stops short of expected effectiveness. And the most disconcerting thing about it is that we do not know why it fails where apparently it ought to succeed and succeeds where apparently it should fail. Outside the technical details of its application, its effect is evidently modified by the type of cancer cell present, by the type of tissue cell in the area, by the condition of the cells in the particular case, and by the resistance or defensive power, both local and general, of that individual. These important items vary with each patient and we know so little about them, even in the normal or typical individual, that it is not strange that there should be certain unexplained results or lack of results in clinical radium work. It is this uncertainty that makes operation the safer plan in the clearly operable cases. We know what can be done with the knife in the individual case. We do not know the extent of effectiveness of radium in an individual case until it is tried in that case. And in the time required for trial by radium the chance of cure by operation slips away.

In order to give the patient the best chance of cure in these early cases it is advisable to employ both radium and operation. First, give a heavy dose of radium, the same as though depending on it to effect the cure. Then within a week or ten days do the radical operation. The operation should be carried out within a short time after the radium treatment because later the connective tissue changes from radium become so marked as to increase very decidedly the difficulties and hazard of the operation.

This plan of treatment for the early case is based on the assumption that the patient is a good operative risk. If the patient has some serious complication making her a poor operative risk, then her best chance of survival, cancer-free may be through radium without operation. The decision for or against operation, and of the extent of operation, turns on a balancing of the hazards pro and con—the hazard of operation, the chance of failure of radium to kill the cancer cells in that individual, and the chance of metastasis near and far. On account of the latter danger, it is advisable to supplement the other treatment by deep x-ray therapy.

Another point, and one which seems at times to be overlooked, is that these powerful remedies require experienced judgment and skill in their application. They are as potent as the knife and in inexperienced hands may produce as disastrous results—either in the form of injury to important organs or as failure to obtain results that could have been obtained by a really efficient application.

PREGNANCY AND CANCER OF CERVIX.

Pregnancy associated with carcinoma of the uterus causes the malignant disease to advance very rapidly. The plan of treatment depends upon the circumstances of the cases. The first point to decide is whether the cancer is removable or irremovable.

Cancer removable. In those cases in which the carcinoma is still in a stage that will admit of complete removal, radical operation at once is indicated, whatever the stage of the pregnancy. There may, of course, be an occasional exceptional case in which it is advisable to wait two or three weeks, because the patient is in poor condition for the operation or to give the premature fetus a better chance for survival. But waiting is dangerous, for every week's delay increases the chance of irremovable metastases.

In regard to the choice of the method for radical operation in these cases, the reported results favor the vaginal method. Pregnancy softens and expands the tissues of the birth canal and thus facilitates the work from below, while at the same time the increased vascularity and friability of the tissues seriously hamper the execution of the radical abdominal operation. When operating from below, the enlarged uterus is emptied of its contents, thus reducing it in size sufficiently to permit of its removal per vaginam.

Cancer irremovable. When the malignant disease has passed beyond the stage for radical operation, the preferable plan is to permit the pregnancy to proceed to term and then deliver by Cæsarean section. After the child is delivered the uterus should be removed (Porro operation).

When the uterus is left, serious infection from the cancerous mass below usually follows. Hence the Porro operation is much the safer. The uterus should be amputated near the junction of cervix and corpus, taking care to avoid cutting through the cancerous tissue if possible. In these cases of advanced carcinoma

of the cervix, any attempt to deliver the child per vaginam is almost certain to result in disaster. The infiltrated, friable tissues are likely to tear through into the rectum or bladder. Even though the patient escapes these serious lacerations, there is great probability of her being carried off by sepsis, the infection extending up from the sloughing cancerous mass.

CANCER OF CORPUS UTERI.

The operative treatment of carcinoma or sarcoma of the corpus uteri is complete hysterectomy, carried out about the same as for fibromyoma or other disease requiring complete hysterectomy. It is well to remove a wide margin of the broad ligament on each side along with the uterus. This can usually be best accomplished when the adnexa are removed at the same time.

The hysterectomy may be abdominal or vaginal, as indicated by the conditions present or the preference of the operator.

If the malignant disease has advanced so far that it is irremovable, the palliative measures to be employed are the same as those already described for malignant disease of the cervix uteri.

CHAPTER VIII.

OVARIAN AND PAROVARIAN TUMORS.

As this work deals only with operative treatment, it does not include the most troublesome phase of ovarian and parovarian growths, viz., differential diagnosis. With the definite diagnosis made, the indications for operative treatment may be expressed in a single sentence. The growth should be promptly removed unless there is some urgent contraindication in the general condition of the patient or in the local complications. Ovarian and parovarian tumors which have demonstrated their character by attaining considerable size (which differentiates them from simple follicular cysts of inflammatory origin) should be promptly removed while the patient is in good condition, because (a) they are not at all influenced by palliative measures, (b) they do not stop growing spontaneously, (c) they tend to death through pressure within a few years, (d) they frequently eventuate in malignancy, and (e) there is no known method of checking their growth except removal.

TECHNIQUE.

The technique will be considered under the following subheads, which are clinical rather than pathological:

Ordinary Pseudomucinous Ovarian Cyst.
Densely Adherent Pseudomucinous Cyst.
Suppurating Cyst.
Dermoid Cyst.
Papillary Cyst.
Endometrial Cyst.
Simple Parovarian Cyst.
Solid Tumor.
Malignant Tumor.
Tumor Complicated by Pregnancy.

Ordinary Pseudomucinous Ovarian Cyst.

This large class includes the majority of ovarian tumors as encountered at the operating table. The cyst is usually multilocular, unilateral, freely movable, well pediculated and presents only a few adhesions. This is the typical ovarian tumor, the removal of which constitutes one of the easiest and most showy of operations and which for decades past has furnished the brilliant success for many a novice in abdominal surgery. It is not always possible, however, to determine the extent of adhesions and other complications before operation, and a supposedly ordinary and easily removable ovarian tumor has occasionally proved the Waterloo of the embryo surgeon.

Incision. In former years it was the custom to operate through a comparatively small incision. After the peritoneal cavity was opened, the cyst was tapped with a large trocar and the fluid drawn off, and then the collapsed sac was removed through the small incision. Most patients recovered without trouble, but there was an occasional case in which the tapping proved disastrous. Some leakage of fluid, with contained bacteria or tumor cells, is inevitable and this may cause serious trouble if the fluid is infected or if the tumor is malignant or if of the papillary or dermoid variety. As these conditions cannot be excluded with absolute certainty, it is advisable to avoid tapping the tumor if possible.

A short incision, as indicated by the solid black line in Fig. 588, is first made for exploration. The bladder may be drawn up by the tumor, hence the peritoneal cavity should be opened first at the upper end, and the incision enlarged

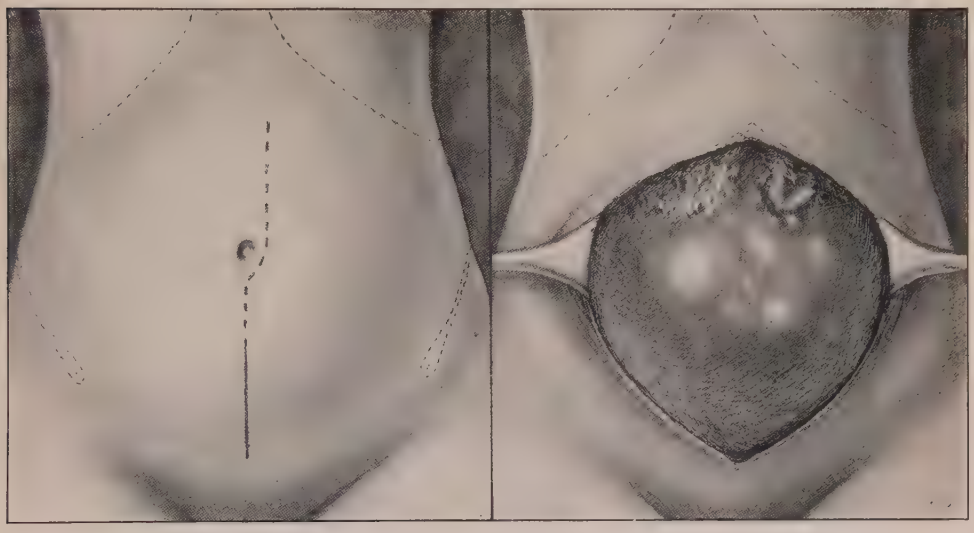


Fig. 588. Fig. 589.

Fig. 588. The abdominal incision for an ovarian tumor. The solid line represents the primary incision for exploration. The dotted line indicates the direction in which the incision is extended as necessary to permit removal of the tumor.

Fig. 589. The incision for a large tumor completed and the tumor projecting into the same. Intestinal and omental adhesions to the tumor are evident.

downward after the bladder has been identified. Through this incision the tumor is inspected and palpated. The diagnosis is confirmed or disproved, and the relations and complications are determined. If the tumor is apparently nonmalignant and removable, the incision is extended upward, as indicated by the broken line in Fig. 588, far enough to permit removal of the growth entire. The length of incision will of course depend upon the size of the cyst, some cysts requiring an incision extending almost to the rib margin. The disadvantage of the long incision is ordinarily more than outweighed by the danger of tapping the cyst.

Lifting out the cyst. The incision having been sufficiently enlarged and spread open (Fig. 589), the adhesions are located and carefully separated. If long and organized, they should be divided and ligated well away from the intestinal wall, but not far enough away to leave long bands that may cause trouble

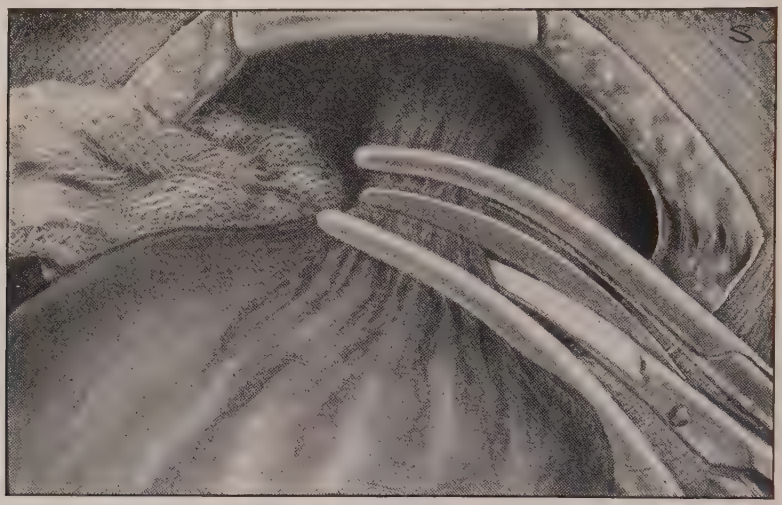


Fig. 590. The tumor has been drawn out of the abdomen, the pedicle has been clamped and the scissors are in place for dividing the same.

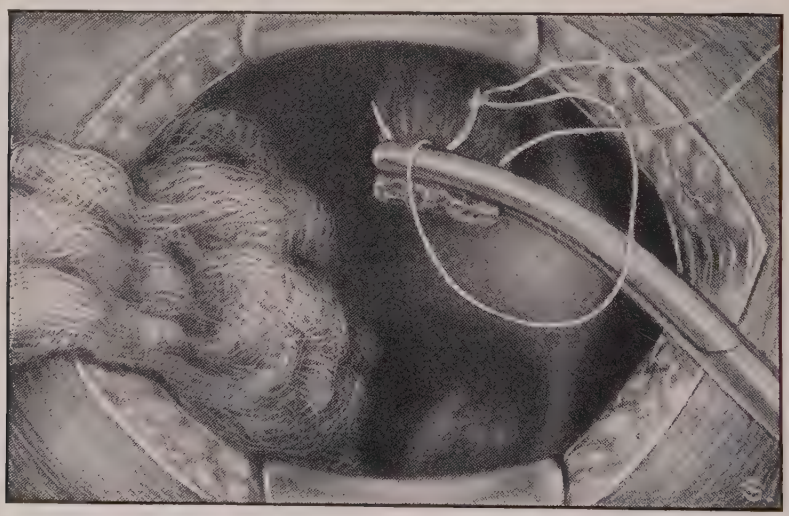


Fig. 591. Ligating the pedicle.

later. Where the intestine is very firmly and closely adherent, it is advisable to leave the outer layer of the cyst wall attached to the intestine rather than injure the intestinal wall. Any raw surface thus left on the intestinal wall may be closed over by bringing the edges of the raw area together by a fine catgut suture,

taking care, of course, to avoid any serious constriction of the intestinal lumen. If the omentum is extensively adherent, it is advisable to clamp and divide it near the cyst, rather than shell off and leave the adherent, infiltrated portion. The clamped end is ligated.

As the adhesions are taken care of, the mass is lifted out of the abdomen. This is a time of considerable danger to the patient. The pressure of the cyst having been removed, the relaxed abdominal vessels may fill with blood to a serious extent. The author's anesthetist has, on several occasions, noticed a distinct effect on the pulse as a large tumor was lifted from the peritoneal cavity. Part of the effect was probably a nervous reflex.

To avoid this sudden filling of relaxed abdominal vessels, with consequent emptying of the heart and cardiac failure, abdominal pressure should be maintained by an assistant, detailed to that task. As the tumor is lifted out, the assistant, with hands spread open, makes firm pressure on the abdomen, and this pressure is to be maintained more or less until the dressing and binder are applied. A large pad of gauze or cotton should be placed under the binder to

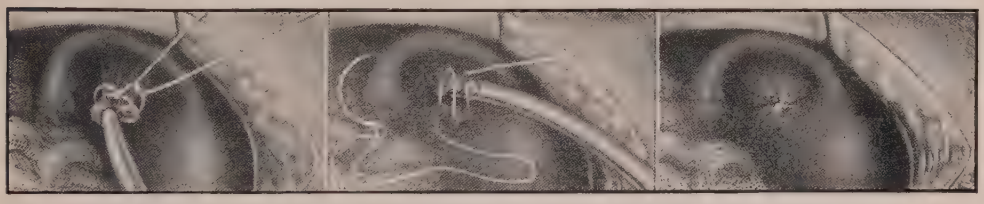


Fig. 592. Fig. 593. Fig. 594.

Fig. 592. Completing the ligation of the pedicle.
Fig. 593. Covering the raw area of the pedicle.
Fig. 594. The pedicle covered, completing the operation.

maintain the pressure for at least twenty-four hours, until the patient's control of the vascular system is fully restored.

Division and treatment of pedicle. The pedicle is isolated and divided between clamps (Fig. 590) and the proximal end ligated. To prevent slipping, the ligature should be sewed in as indicated in Fig. 591. After this is tied, it is well to take an extra turn of the ligature about the whole stump, as shown in Fig. 592, to include any portion that may have been missed in the ligation of the main vessels. The raw end of the pedicle is then turned in and covered, as shown in Figs. 593 and 594. It will be noticed that the tube is here preserved. This may be advisable if the tube is normal, particularly if in a comparatively young woman the other tube must be sacrificed.

When the tube is adherent, it is removed with the tumor, as shown in Fig. 595. If the remaining part of the tube is normal, the pedicle may be simply ligated as previously described; but if this stump of tube is diseased, it should be removed to within the uterine wall and the wound closed, as indicated in Figs. 596 to 599. The end of the pedicle is turned in (Fig. 600) and then all raw margins

are covered by bringing over the round ligament, as shown in Figs. 36 and 37. Any other intra-abdominal work required is carried out and the abdomen is closed in the usual way.

Tapping the cyst. In the presence of exceptional conditions, it may be advisable to tap the cyst. For example, in a recent case in the author's service at Washington University Medical School, the tumor was so large that the patient could not lie down, and even when propped up in bed, as had been necessary for some weeks, there was considerable dyspnœa and cyanosis. On account of the pulmonary restriction any general anesthetic would have been hazardous. The attempt at spinal anesthesia failed because the large tumor prevented the

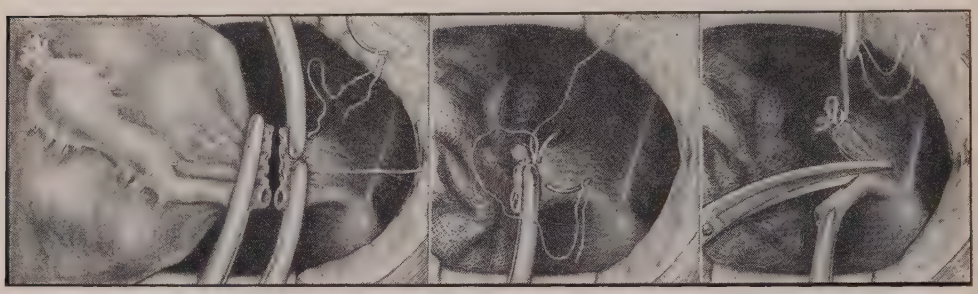


Fig. 595. Fig. 596. Fig. 597.

Fig. 595. Removing the Fallopian tube along with the tumor.
Fig. 596. Ligating the vessels supplying the tumor.
Fig. 597. Excising the stump of the diseased tube.

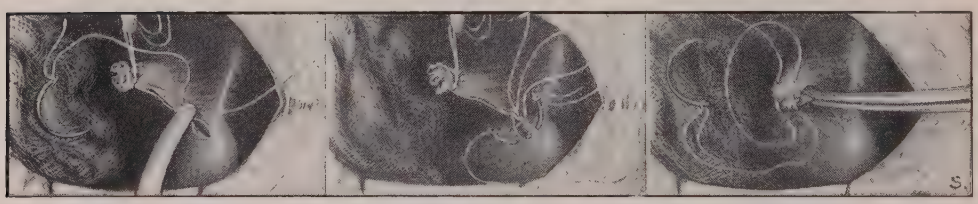


Fig. 598. Fig. 599. Fig. 600.

Fig. 598. Ligating the vessels supplying the tube.
Fig. 599. Completing the suturing of the wound left by the excision of the stump of the tube.
Fig. 600. Burying the end of the vascular pedicle.

patient bending forward. A small incision was then made under local anesthesia, the cyst tapped and the greater part of the fluid drawn off. The pulmonary restriction having been thus removed, the patient could then lie down and take an anesthetic without special risk. The general anesthetic was then given, as the adhesions of the tumor in the upper abdomen were too extensive to permit of completion of the operation under local anesthesia.

When tapping is employed, the tumor may usually be removed through a subumbilical incision of moderate length. The incision is made and the tumor

wall exposed as indicated in Fig. 601. The large trocar with tube attached is then introduced as indicated in Fig. 602, while an assistant presses the abdominal wall securely about the tumor (Fig. 602), to prevent leakage of fluid into

Fig. 601. Location and length of the incision for tapping the cyst immediately before removal. Such tapping is occasionally advisable, in cases where the tumor is large and interferes with respiration so much as to necessitate beginning the operation under local anesthesia.

Fig. 602. Tapping the cyst.

the peritoneal cavity and to increase the flow of fluid through the tube. If desired, gauze may be placed about the puncture to catch fluid that may escape around the trocar. As a rule, however, this gauze does but little if any good and is in the way.

As the fluid escapes through the tube and the cyst wall becomes lax, it is grasped with forceps (Figs. 602 and 603) and held well up about the trocar. Care should be taken to avoid lacerating the cyst wall, which in some cases is very friable, particularly when there is infection or severe hemorrhage in the cyst or torsion of the pedicle. These complications make the wall edematous and easily torn. As the sac becomes partially emptied, the punctured area is gradually drawn out of the wound and to one side (Fig. 603) so that, if there is leakage, the fluid will not get into the peritoneal cavity. As the sac still further collapses, it is drawn out more and more. As adhesions are encountered (Fig. 604) they are carefully separated. If the emptying of the fluid from one

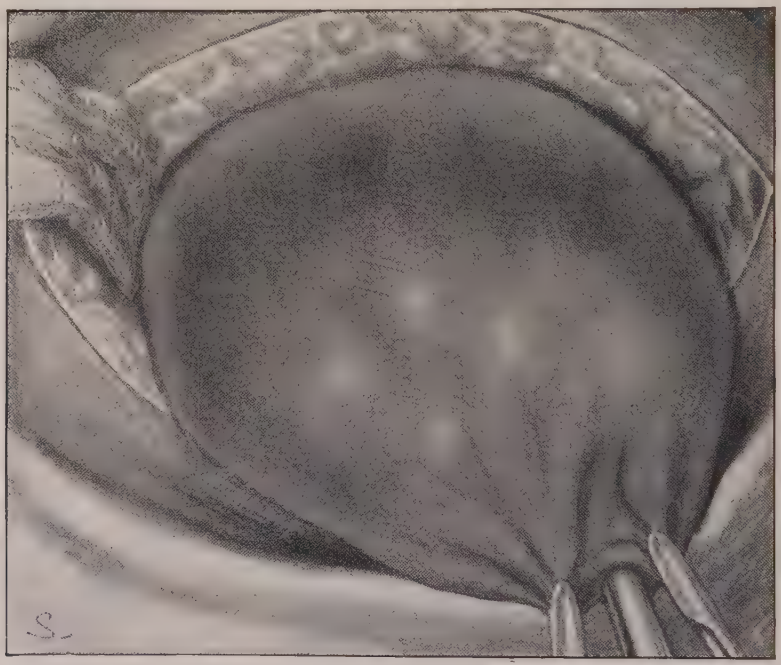


Fig. 603. Drawing out the partially emptied cyst.

compartment of the tumor does not reduce it sufficiently, other compartments may be emptied, either by puncture through the intervening wall or by withdrawal of the trocar and puncture through some other part of the cyst envelope. Usually the emptying of one or two main compartments will be sufficient. Just before the removal of the point of the trocar the region of the puncture is clamped with a forceps from each side, as shown in Fig. 604, to prevent leakage through the puncture.

The adhesions having been separated and the sac brought out, the pedicle is treated as already described. Occasionally the cyst material is of such jelly-like consistency that it will not flow through even the largest trocar. In such a case the incision must be enlarged to permit removal of the growth entire.

Densely Adherent Pseudomucinous Cyst.

Extensive adhesions may be due to inflammation of surrounding structures, such as the tubes or appendix, or it may be due to disturbance in the cyst from intracystic hemorrhage or torsion of the pedicle or infection of the cyst.

By rapid and careful work the adhesions may be separated and the tumor removed in all but exceptional cases. If the patient is in bad condition, or if for other reason it is thought best to leave a large part of the adherent wall, the cyst should be laid open (the abdominal viscera being protected by gauze), all cavities broken into and the contents and lining of the cyst removed. The further treat-

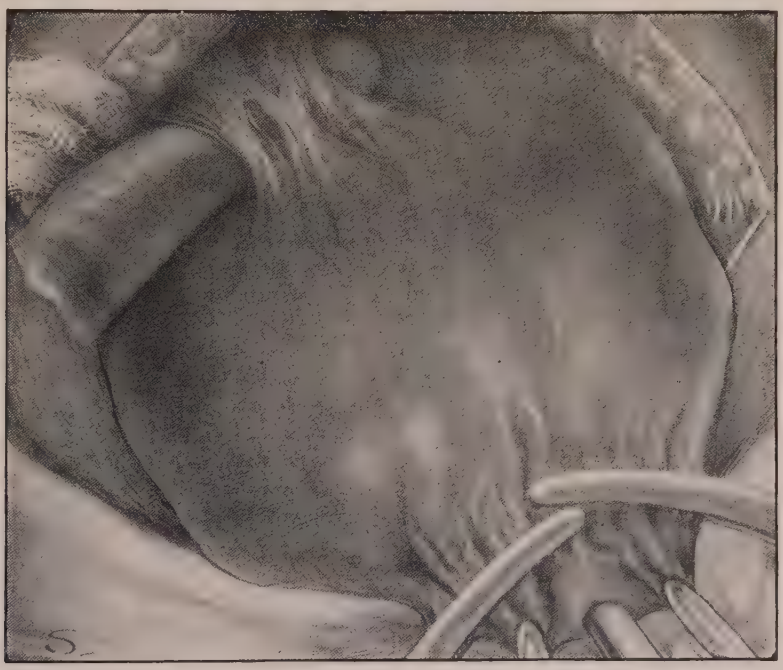


Fig. 604. Method of clamping the cyst wall to prevent leakage as the trocar is withdrawn. Adhesions are shown at the upper part of the cyst wall. After the adhesions are separated, the collapsed cyst is drawn out and the pedicle ligated as already described.

ment depends on the amount of cyst wall left. If it is only a small amount, all remnants of the lining are removed, leaving only the outer wall. This is folded and sutured in such a way as to cover raw surfaces, and the abdomen closed, with or without drainage as thought advisable.

If the larger part of the cyst wall must be left the margins are sutured to the peritoneum at the abdominal wound and gauze is packed into the cavity to check oozing. The abdominal cavity is then closed sufficiently to prevent hernia, a considerable part of the lower portion being left open for the exit of the gauze and the drainage of the cyst cavity. This opening should be maintained until the cavity of the cyst is obliterated by shrinkage and granulation, a process requiring

some weeks. In these exceptional cases, this plan is much safer for the patient than a persistence in a prolonged attempt to separate all adhesions, with its attendant shock and blood loss. The important point is to remove every vestige of the lining cells if possible, keeping in mind that there are usually many prolongations forming small cysts between the inner and outer layers of the cyst wall. If the patient's condition is so serious that there is not time for this thorough removal of the lining, all palpable secondary cysts, even the small ones, should be broken into, after which the subsequent granulation may destroy them. A small secondary cyst, if unbroken, is likely to grow and form another large tumor.

Suppurating Cyst.

A cyst filled with pus from recent suppuration presents a most serious condition, for the bacteria are presumably still active and virulent. In such case it is particularly important to remove the cyst entire, without leakage if possible. In many of these cases, however, extensive adhesions have formed, which, with the friability of the wall, prevent clean removal. In that case, the cyst is treated much the same as any other abscess, i. e., removal of as much as practicable and drainage of the remaining portion.

In a case where the diagnosis of suppuration can be made before operation and the pus collection can be reached and drained satisfactorily per vaginam, that plan of attack may be preferable. This will be principally in broad-ligament cysts or in small ovarian cysts bound in the pelvis by adhesions. The drainage and subsequent granulation may obliterate the cyst. If abdominal operation is necessary later, it is made with the patient in better general condition and with less extensive local suppuration.

Dermoid Cyst.

The contents of dermoid cysts are much more irritating than the contents of ordinary cysts. They are more likely to present troublesome adhesions and to undergo suppuration. Even when there is no suppuration, the fluid is irritating and the escape of any of it carries the danger of peritonitis. Consequently in the removal of dermoid cysts, particular care should be exercised to avoid rupture or laceration of the wall.

Papillary Cyst.

The papillary cyst (serous cyst, cystadenoma invertens) presents special characteristics of sufficient interest to warrant its separate consideration.

1. The new growth is not confined entirely within the cyst wall, but papillary masses perforate the wall and attach themselves to adjacent peritoneal surfaces.

2. These secondary papillary growths, springing from the surface of adjacent organs, may be so luxuriant as to fill the pelvis. The papillary mass filling the pelvis obscures relations and gives very much the appearance of a malignant growth infiltrating the pelvic structures generally. It has frequently been mis-

taken for such, the subsequent history of the case revealing the nonmalignant character of the growth.

3. Papillary cysts very frequently undergo malignant change, so that at the time of operation or later, a real carcinoma is found. Usually malignant disease of the ovary is bilateral, for the reason, supposedly, that it arises in most cases from papillary cysts, which are bilateral. The papillary cyst seems to be a border-line growth, in some cases developing the characteristics of malignancy and in other cases not. In fact, in a single growth, some portions may show malignancy and other portions be nonmalignant. It is a most interesting growth pathologically as well as clinically, and presents questions which are still unanswered.

4. Papillary cysts are nearly always bilateral sooner or later. Consequently when an undoubted papillary cyst is found on one side, the other ovary, also, should be removed, unless there is some very strong reason for not doing so.

5. In a case where portions of the growth must be left, because of intimate attachment to surrounding organs, these remaining remnants may disappear and the patient recover entirely. This has happened in a number of cases in which the tumor was considered malignant at the time of operation. On the other hand, the remaining secondary growths may multiply and, with the local disturbance and the associated bloody ascites, finally undermine the patient's general health and cause her death. Also, at any time genuine malignancy may appear, with destructive infiltration of surrounding organs.

6. It may be difficult or impossible at the time of operation to determine certainly whether the growth present is malignant or nonmalignant, particularly when there are complicating adhesions matting the structures together and obscuring relations. Even microscopic examination of the removed portions does not settle the matter positively as to the remaining portion. The removed part may show malignant formation and the part left be nonmalignant. On the other hand the removed part may show no malignant area, the latter being confined to the unremoved portion. Consequently, the plan of operation in these uncertain cases, is (a) to remove all the growth possible with safety, on the supposition that it may not be malignant, but (b) to avoid undue jeopardy of life or comfort, by severe hemorrhage or injury of important organs, knowing that the growth may be malignant and the effect of operation only temporary.

7. After operation, particularly where portions are left, the patient should be closely watched for an increase in the pelvic growth or a return of the bloody ascites. Every means should of course be used to increase the patient's resistance and thus aid in overcoming the extraneous growth. In the experience of the author, Roentgen ray treatment by the improved method of massive doses, has had a very decided beneficial effect on the portions of growth remaining after operation.

8. Papillary cysts may arise from the ovary or from the broad ligament. They are supposed to originate in certain parovarian tubule-remnants, which are found both in the broad ligament and in the hilum of the ovary. If originating between

the layers of the broad ligament, this relationship will be apparent in the early stages, but later the papillary growths and the adhesions obscure the relations.

Endometrial Cyst.

This type of ovarian cyst is lined or partly lined by a tissue made up of glands and stroma resembling the endometrium of the uterus. Not only does the tissue look like endometrium, but it acts like endometrium—it menstruates. Along with the uterine endometrium it passes through the various phases of menstruation. Blood is extravasated into the tissues and passes into the cavity. There being no outlet for this menstrual blood it accumulates and distends the cyst. The retained blood undergoes more or less disorganization, and constitutes the chocolate-colored material which escapes from the cyst as the adhesions are broken in operative removal.

The accumulating contents or the advancing growth of the endometrial elements, or both, cause early perforation of the cyst wall and leakage of its contents. The escaping contents carry elements of the endometrial lining, which implant themselves on adjacent surfaces and grow into the walls of the organs—reproducing there endometrial tissue like the original. This results in dense adhesions of the affected ovary and cyst to adjacent structures. The leaking cyst-contents may gravitate to the posterior peritoneal culdesac, causing there dense adhesions from similar growth (adenomyoma of recto-vaginal septum). Adhesions to the uterine wall take place, with resulting inward growth of the implanted endometrial elements. Thus originate certain of the subperitoneal adenomyomata of the uterine wall.

Early perforation with dense adhesions from implantation-growths is a constant feature of these cysts, and the adhesions involving the rectum and sigmoid and other structures seriously complicate the operation for removal. Hence these endometrial cysts are important from the clinical as well as from the pathological standpoint. They are found in operative work much more frequently than is generally supposed. A well-marked case of this disease, with its extensive and dense adhesions and irritating "chocolate" fluid, escaping as the adhesions are separated, also presents some serious problems in treatment. The first problem is in regard to the separation of the adhesions and liberation of organs for satisfactory surgical replacement or removal. The adhesions are not simple agglutination of surfaces, as in inflammatory trouble, but real tissue ingrowth into the surrounding organs, hence the separation is exceedingly difficult and dangerous, as there is likelihood of tearing through the wall of the adjacent intestine. In the author's experience the higher pelvic adhesions, about the ovary, tube and corpus uteri, can with care and patience be safely separated, but in several instances he has not been able to separate the lower adhesions, those about the culdesac and involving the rectum and posterior surface of the cervix uteri. In these cases the culdesac was obliterated and the cervix and rectum were so completely fused by old organized tissue that to persist in the attempt to

separate was likely to lead to a tear in the rectum. So in these cases, where operation was for retrodisplacement, the lower portion of the uterus was left attached and the upper portion only was raised as much as possible and fastened. In the cases where hysterectomy was required, supravaginal hysterectomy only was adopted where feasible in place of complete hysterectomy.

Another serious clinical problem presented by these cases, is in getting the patient through without peritonitis or intestinal paralysis. Just what factor it is that makes these patients so prone to peritonitis and intestinal paralysis is not altogether clear, for there is no infection; but that the danger is great is only too painfully evident to those engaged in pelvic surgical work. Three trying experiences in the last two years have convinced the author that this disease constitutes one of the most serious and fatal pelvic conditions for which operation is required in the childbearing period.

The first of these experiences came about two years ago. At operation was found the typical condition of endometrial cyst, with the dense adhesions and the "chocolate" contents leaking from the cyst. There was no pus and no evidence of infection, consequently no drainage was employed, the abdominal wound being closed entirely, as in all noninfected cases. The patient developed intestinal paralysis, probably due to a low grade peritonitis, which led to persistent fecal vomiting. This was finally overcome by opening a distended intestinal coil and draining away the contents, thus leaving the stomach and upper intestinal tract for taking care of nourishment. It was a long hard siege, but the patient finally recovered, the artificial intestinal opening being closed by operation when no longer needed. In the second experience a young married woman in good general health, had a painful pelvic mass, requiring operation. The operation revealed a case of bilateral endometrial cysts of the ovary with extensive adhesions, and as the adhesions were broken there was the escape of a considerable amount of chocolate-colored contents. There was no pus and no evidence of infection then or previously. So the abdominal wound was closed without drainage. A low grade peritonitis developed with resulting intestinal paralysis. The peritonitis increased, an acute nephritis developed, the patient went from bad to worse and finally died in spite of peritoneal drainage, intestinal drainage and everything else that was done. The third experience was in a consultation case. The author was called hurriedly in the night to a hospital, by one of our best gynecologists—to see a patient who was then dying of peritonitis. A young married woman of prominent family had been subjected to operation for a troublesome pelvic mass. No pus was found and the development of peritonitis was a great surprise and shock. Inquiry revealed that extensive, dense adhesions were encountered and some cysts with typical "chocolate" contents.

Of course other cases in the author's experience have been more fortunate and have come through with very little trouble. But intestinal paralysis and peritonitis are likely to develop in any of these cases and when once developed

are most difficult to handle. These serious experiences have led the author to adopt drainage in all cases of well-marked endometrial cyst, and in cases of dense adhesions that are suspicious of endometrial cyst. In recent months he has employed primary peritoneal drainage in several of such cases with most satisfactory results, and consequently does not now dread to encounter these cases, as he formerly did.

Simple Parovarian Cyst.

From the standpoint of surgical treatment, there are two kinds of parovarian cysts—the papillary cyst and the simple cyst. The former has been considered above. The simple cyst, filled ordinarily with clear fluid, is troublesome principally because of pressure on and displacement of surrounding organs. Limited

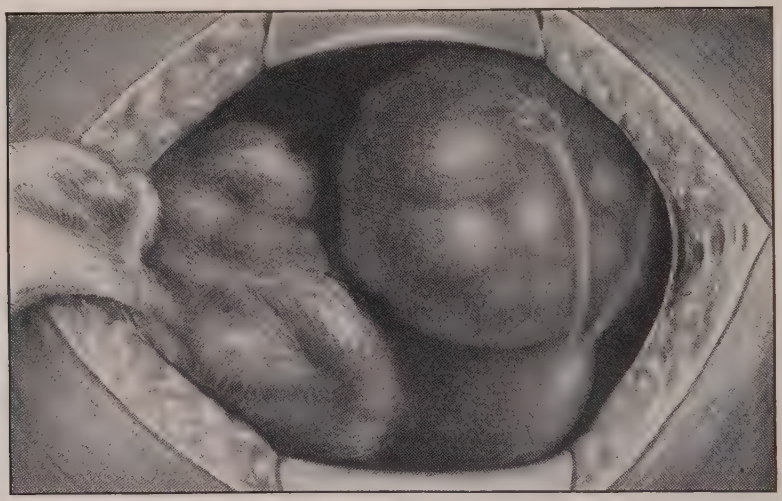


Fig. 605. Indicating the relations of a broad-ligament tumor. The posterior layer of the broad ligament is pushed backward and the tube is stretched over the tumor.

by the layers of the broad ligament, within which it grows, it early displaces the uterus and bladder and causes pressure symptoms. The Fallopian tube is usually stretched out over the cyst to a greater or less extent, as indicated in Fig. 605.

In removing such a cyst it is necessary to cut through the peritoneum. The distorted tube, also is to be removed. The ovarian and uterine vessels are clamped and divided as shown in Figs. 606 and 607. After free division of the peritoneum the cyst is shelled out of the broad ligament. The beginning of the process is indicated in Fig. 608. There is usually a rather free blood supply at the bottom of the growth. When this area is reached, the vascular tissue is condensed into a pedicle, which is clamped and divided (Fig. 609). When the tumor has been freed except for the posterior peritoneum, this is divided, as indicated in Fig. 609, and the tumor removed.

The enucleation of the tumor leaves a large cavity in the broad ligament, into

which considerable oozing may take place if hemostasis is not carefully looked after. The pedicle at the bottom of the cavity is securely ligated (Fig. 610), and then the sides of the cavity are approximated by sutures which pass back and forth, as shown in Figs. 611 and 612, the deeper sutures being placed just above the ligated pedicle. In placing these sutures for obliterating the cavity, it is necessary to bear in mind the location of the ureters, that they be not included

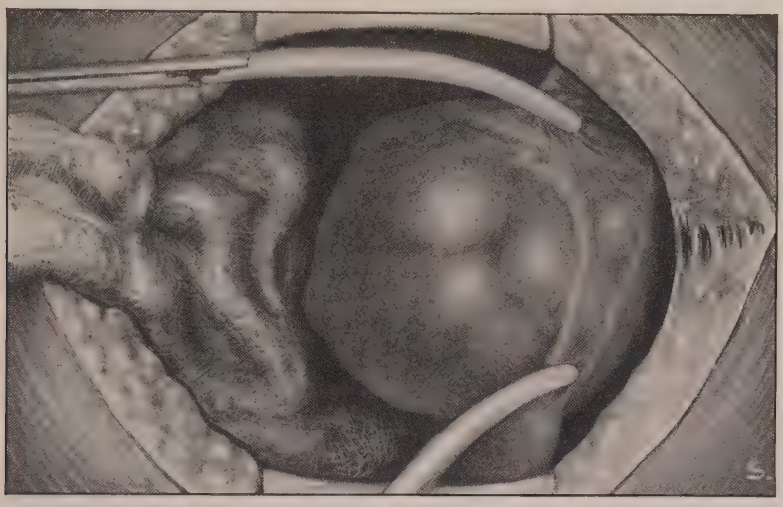


Fig. 606. Removal of a broad-ligament tumor. The vessels at the outer and inner sides have been clamped.

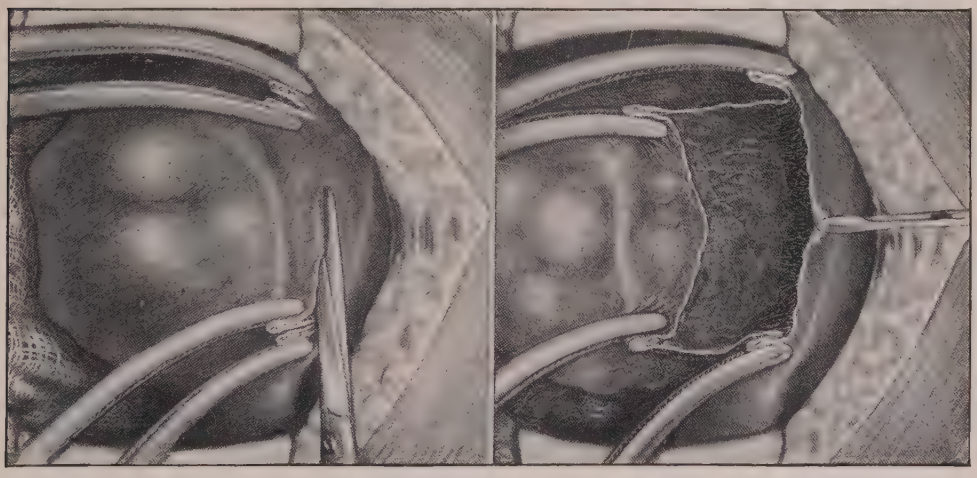


Fig. 607. Fig. 608.

Fig. 607. Dividing the peritoneum over the tumor, after the outer and inner vessels have been doubled-clamped and divided.

Fig. 608. Enucleating the tumor from the broad ligament.

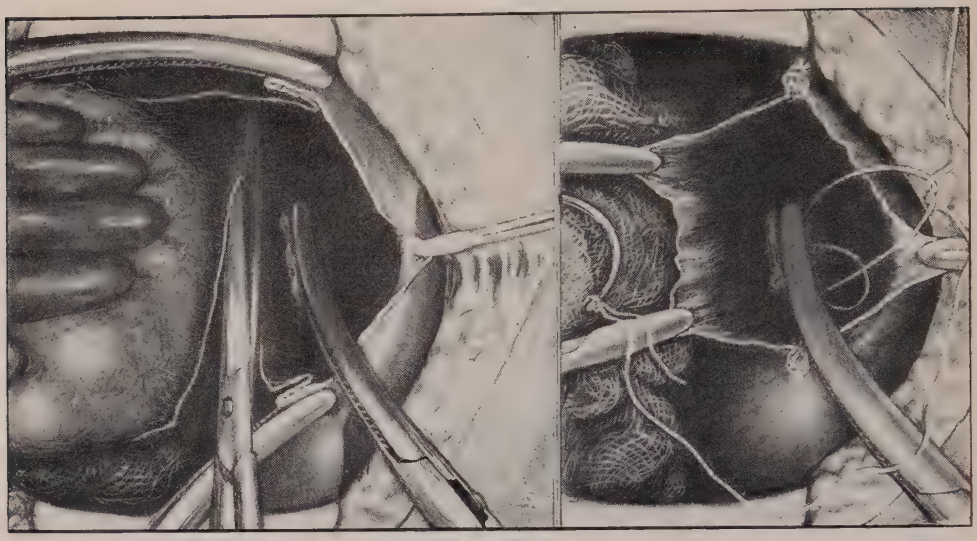


Fig. 609. Fig. 610.

Fig. 609. The tumor enucleated and the posterior layer of peritoneum being divided where it joins the tumor.

Fig. 610. Ligating the vascular pedicle beneath the tumor.

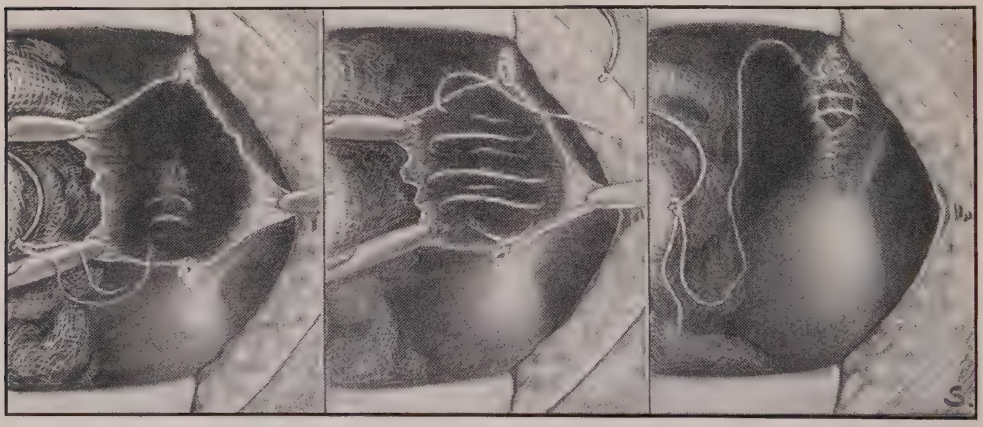


Fig. 611. Fig. 612. Fig. 613.

Figs. 611, 612 and 613. Closing the cavity left in the broad ligament by the removal of the tumor.

in a suture. When the cavity has been satisfactorily obliterated, the peritoneal edges are approximated and turned in by suture, as indicated in Fig. 614.

In some cases, where the cyst is small and the adnexa are not much affected, it may be advisable to preserve the ovary and tube. The method of procedure in such a case is detailed and illustrated in the chapter on conservative surgery (Figs. 664 to 669).

Solid Tumor.

Solid tumor of the ovary is rare and the diagnosis is usually made after the abdomen is open. Being solid and so near the uterus, it is naturally supposed to be a pediculated fibroid.

The treatment of solid tumor of the ovary is the same as the treatment of cystic tumor—namely, removal without unnecessary disturbance of surrounding structures.

Malignant Tumor.

The malignant tumor of the ovary may be a solid tumor from the start or it may consist of malignant masses associated with a cyst, usually a papillary cyst. The papillary cyst is in fact a border-line growth and constitutes quite a troublesome problem in regard to malignancy, as already explained.

Any ovarian or broad-ligament tumor, developing after the age of forty, should be promptly removed because of the possibility or probability of malignancy.

The method of operation is to remove all the tumor if practicable and, if not, then as much as can be removed without unduly jeopardizing the patient's life or comfort. In a case where the malignant infiltration and adhesions are very extensive, it would cause the patient unnecessary suffering and increase the rapidity of the growth of the tumor to break up adhesions and start hemorrhage about masses that could not be removed. In such an extensive involvement, it is advisable to leave the malignant adhesions undisturbed, simply excising small portions of the growth for microscopic examination.

In any case where portions of the growth are left, roentgenization by massive doses is advisable.

Tumor Associated with Pregnancy.

An ovarian tumor constitutes a very serious complication of pregnancy. If the tumor is large, it precludes the development of the pregnancy to term. If small or medium size, the pedicle may at any time become twisted. This causes serious symptoms, necessitating operation at once. The marked peritoneal irritation present when there is torsion of the pedicle, is very likely to lead to a miscarriage—hence it is important to operate before the development of this complicating condition.

For purposes of treatment, the cases may be divided into two groups, as follows:

1. Ovarian tumor associated with early pregnancy (*less than six months*). In such a case, the tumor should be removed by operation, and, as a rule, the earlier in pregnancy the operation is carried out, the better. Miscarriage in the next few days is, of course, one of the dangers to be considered. But it is not probable, if the operation is carried out carefully and with no unnecessary uterine or peritoneal manipulation. In most cases, the pregnancy continues without in-

terruption. An important point in the after-treatment is to give sedatives freely, to diminish the chance of expulsive uterine contractions.

2. Ovarian tumor associated with late pregnancy (past six months). In such a case, unless the tumor is so large as to preclude further development of the pregnancy, it is advisable to postpone operation until near term. Then, if labor follows the operation, the child may be saved.

If the patient can be carried to near term, it may be advisable to deliver the child by way of the abdomen at the same time that the tumor is removed. The advisability of this is of course determined by a careful consideration of all conditions present in the individual case. It is particularly indicated whenever there is any condition which makes the safe delivery of the child per vaginam problematical.

In some cases, however, in the sixth or seventh month, the masses fill the abdomen and produce so much dyspnea that immediate operation is imperative. In such a case, the tumor should be removed with the least possible disturbance of the pregnant uterus.

CHAPTER IX.

ACUTE PELVIC INFLAMMATION.

The indications for operative treatment in acute pelvic inflammation depend upon the location and severity of the inflammatory process. The inflammation may be in the Fallopian tubes (salpingitis) or in the ovaries (oophoritis) or in the peritoneum (pelvic peritonitis) or in the connective tissue (pelvic cellulitis, parametritis). The etiology also has some bearing. If the infection has followed labor or abortion, it must be determined that the interior of the uterus is clean—that is, that there is no large placental remnant or decomposing blood clot or collection of pus retained within the uterus. This may require exploration of the uterine interior with the finger or curet. If the infection has taken place through an operation wound of the cervix, the sutures are to be removed, to give free drainage to the inflamed area.

Aside from the preliminaries mentioned, the operative treatment of acute pelvic inflammation may be considered under the following subdivisions:

Vaginal Drainage of Pelvic Abscess.
Abdominal Extirpation of Mass.
Peritoneal Drainage.
Operation for Thrombophlebitis.

Vaginal Drainage.

Indications. In all cases presenting an acute inflammatory mass in the pelvis, in which appendicitis and tubal pregnancy and suppurating tumor can be excluded, abdominal operation should be avoided, unless a spreading peritonitis is present. If the drainage is necessary, it should be effected by way of the vagina if practicable.

Vaginal drainage of an acute inflammatory mass is advisable in the following definite classes of cases:

1. When a *collection of pus* can be felt *low* in the pelvis. The pus may bear any one of three relations to the peritoneal cavity. In most cases where the abscess is low, the pus is in the *connective tissue* about the uterus (broad ligament abscess). In some cases the pus is in the posterior *peritoneal culdesac.* This is due to peritoneal inflammation, with or without escape of pus from the tubes. The collection of pus is shut off from the general peritoneal cavity by a wall of exudate above it. Occasionally a *tube* distended with pus will be found deep in the culdesac, giving a fluctuating mass low in the pelvis. If the pus is still confined wholly within the tube, there being no local peritonitis and no protecting wall of exudate above, it would be preferable to avoid operation unless the symptoms are decidedly threatening. It may be difficult to be certain

whether or not the pus is still confined to the tube. In general, however, severe cutting pains indicate involvement of the peritoneum, with exudate and protective walling-off.

2. When there is an *inflammatory mass* in the connective tissue *low* in the pelvis and the symptoms are progressive, drainage is indicated even though no fluctuation can be felt. There may be a small collection of pus deeply placed and obscured by the surrounding infiltration. However, if no pus is found on exploration of the mass, the drainage is beneficial and aids in checking the inflammatory process.

3. When there is an *inflammatory mass* in the connective tissue *high* in the pelvis with persistent severe symptoms indicating pus, vaginal drainage is advisable, provided the mass can be safely reached from below.

4. In pelvic peritonitis of virulent type, in which the inflammation is progressing seriously in spite of palliative measures, an opening into the posterior peritoneal culdesac for drainage, may be advisable. To be effective, the vaginal drainage must be instituted while the process is still confined largely to the pelvic peritoneum. In general peritonitis, more extensive drainage is necessary.

Technique. When the abscess has progressed so far that it is separated from the vaginal cavity only by the thinned out vaginal wall, opening it is a very simple matter and may be carried out under local anesthesia or even without any anesthesia. This condition, however, should seldom be encountered, for the abscess should be recognized and drained long before this late stage is reached.

The drainage of a pelvic abscess in the early stage requires knowledge and skill in order (a) to avoid injury to surrounding structures, and (b) to make provision for really curative drainage. In the early stage the abscess is small and is at a distance, greater or less, from the vaginal wall and lies in the midst of important structures, some of which may intervene between it and the point of incision in the vaginal wall. The steps of the operation, in such a case, are as follows:

1. Examination under anesthesia. After the patient is anesthetized and the vagina cleansed, a bimanual examination is made to determine the size and relations of the inflammatory mass and what portion of it is fluctuating. It is determined also whether or not the corpus uteri is forward and hence out of the way of the operative work.

2. Incision through the vaginal wall. The self-retaining speculum or a simple perineal retractor is introduced, the vagina again cleaned with an antiseptic solution, the posterior lip of the cervix is caught with a tenaculum-forceps and the cervix raised so as to expose the posterior vaginal vault. Now, with a long forceps, firm hold is taken of the posterior vaginal wall, a short distance back of the cervix and then with a scissors or knife the vaginal mucosa is divided between the forceps and the cervix (Fig. 614). The author usually uses the same blunt curved uterine scissors with which the subsequent dissection is made. By a little traction on the forceps a ridge of mucosa is raised which is easily clipped through with the scissors. The opening is then lengthened to each side, curving

slightly around the cervix, until it is an inch to an inch and a half long (Fig. 620). This gives an opening into the connective tissue back of the cervix, as shown in Fig. 614.

3. Blunt dissection through connective tissue. This is most safely and conveniently accomplished by the sense of touch alone. The speculum, or perineal retractor, is removed and two fingers are introduced into the vagina, one of the fingers being carried into the wound back of the cervix. With this finger, blunt dissection is made upward through the connective tissue, keeping close to the wall

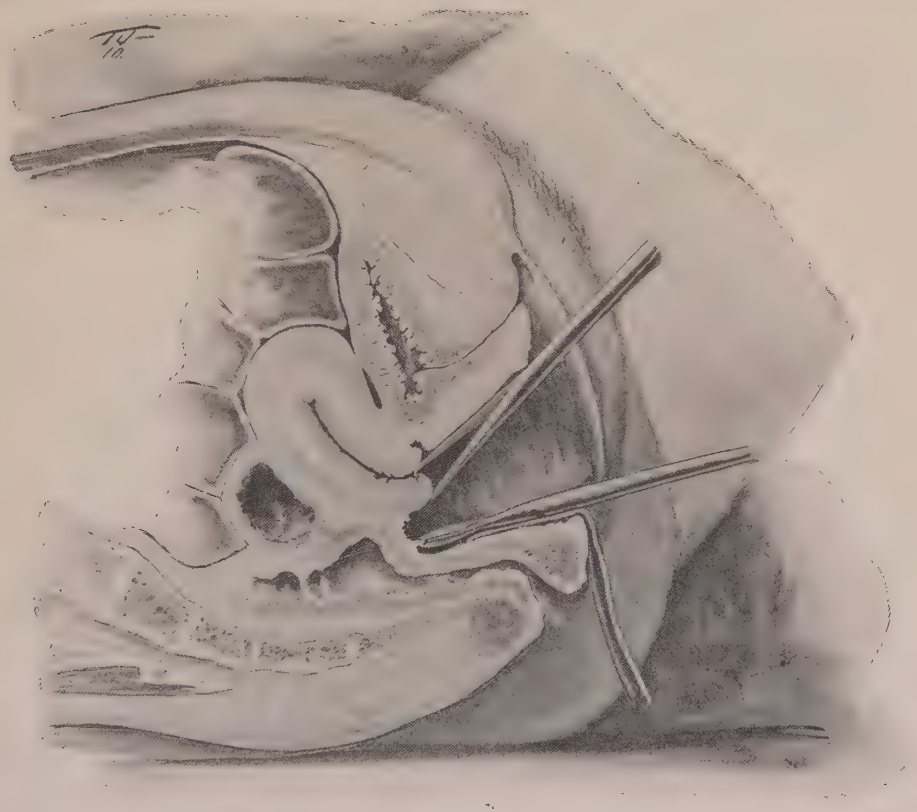


Fig. 614. Vaginal Drainage of a Pelvic Abscess. Incision through the vaginal wall. The retractor has been introduced, the cervix caught with a tenaculum-forceps and the vaginal wall clipped through just back of the cervix.

of the cervix, which is distinguished by its greater hardness. This dissection is facilitated by introducing the closed blunt scissors some distance ahead of the finger as shown in Fig. 615, and then opening the scissors widely. The finger is introduced into the opening thus made in the connective tissue, and the scissors are again introduced beyond the finger and opened widely. In this way a wide tract may be made rapidly through the connective tissue, and it may be made safely, provided the operator keeps close to the cervix as indicated in Fig. 615. Each arrow in this illustration may be taken to represent a forward thrust of the

blunt scissors beyond the end of the finger. Notice that the direction of the dissection carries it between the uterus and the abscess instead of between the rectum and the abscess, and thus the danger of tearing into the rectum is avoided. On the other hand, the dissection must not be carried into the cervix uteri. Involvement of the tough tissue of the cervical wall is indicated by the blunt dissection becoming very difficult while still some distance from the abscess.

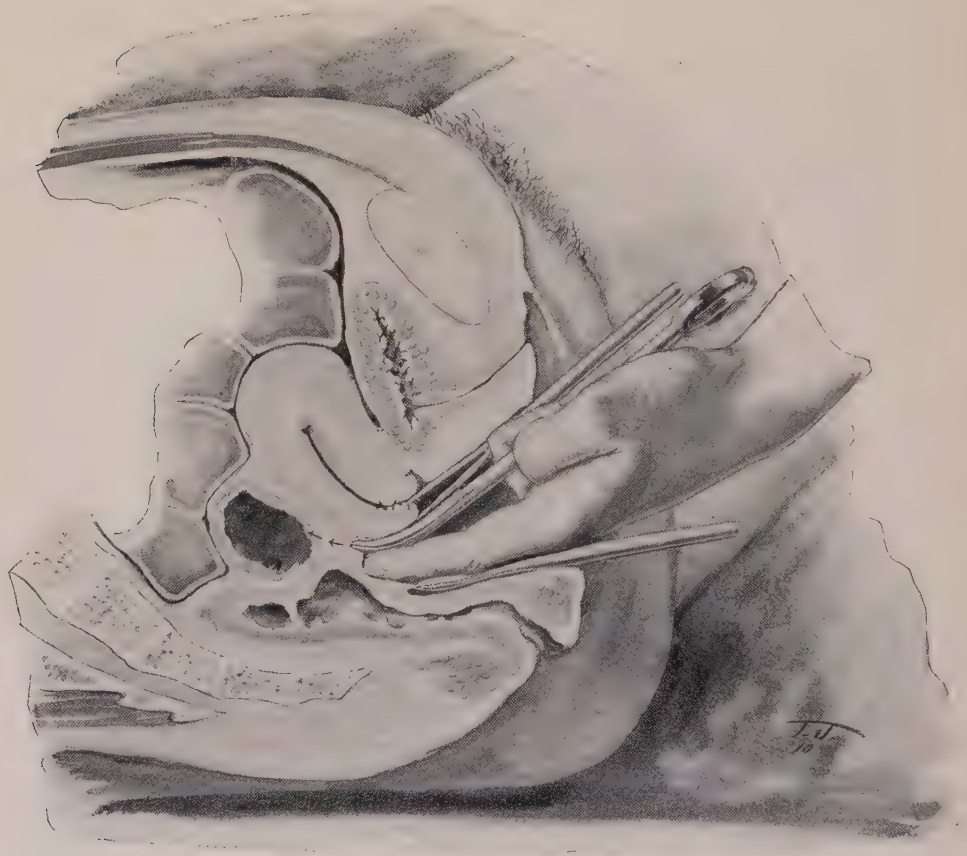


Fig. 615. Blunt dissection through the connective tissue. The retractor has been removed to permit the fingers to be introduced into the vaginal incision, and dissection is now being made through the connective tissue with the fingers and blunt scissors, as described in the text. The arrows show the direction of the dissection (between the abscess and the uterus and not between the abscess and the rectum), and each arrow may be taken to represent a forward thrust of the blunt scissors beyond the end of the finger.

4. Puncturing the abscess wall. When the wall of the abscess is reached, further advance by blunt dissection becomes very difficult or impossible. This wall of dense infiltration blocking further advance is especially marked in a long-standing abscess, but it is present in acute abscesses also to a considerable extent. The blunt scissors are now exchanged for the sharp-pointed scissors,

and with these the puncture is made into the center of the inflammatory mass. Care must be taken to make sure that the puncture will not extend into the rectum. A hard fecal mass in the rectum may be mistaken for a portion of the inflammatory mass, or a gas-distended part of the rectum may simulate the soft, elastic feel of a fluctuating mass, or a collapsed pocket of the rectum may project between the vaginal vault and the abscess. In Fig. 614 this dangerous proximity

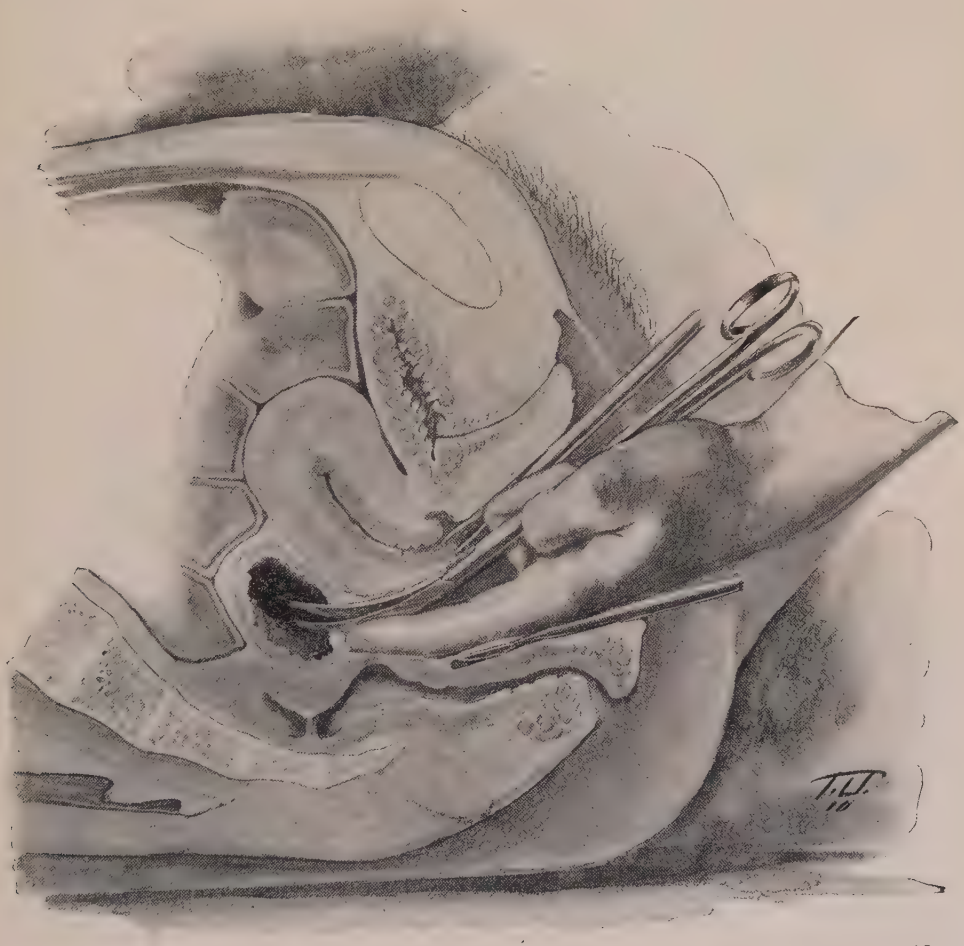


Fig. 616. Penetrating the abscess wall. The sharp-pointed scissors, under the guidance of the finger, have been introduced into the mass and then opened widely.

of the rectal wall to the operative tract is well shown. If the line of blunt dissection is kept close to the uterus, the abscess wall is reached close to the uterus, with a considerable part of the abscess lying between the point of puncture and the rectum, as shown in Fig. 615. Should there be any doubt about this, leave the scissors in the tract and, with gloved fingers, make an examination per rectum. This examination gives a clear idea of the amount of tissue between the

point of intended puncture (indicated by the end of the scissors) and the nearest portion of the rectal wall.

After the curved, sharp-pointed scissors have been pushed into the center of the mass, they are opened widely (Fig. 616) and then withdrawn while still wide open. This makes a large tract into the abscess. One or two fingers are

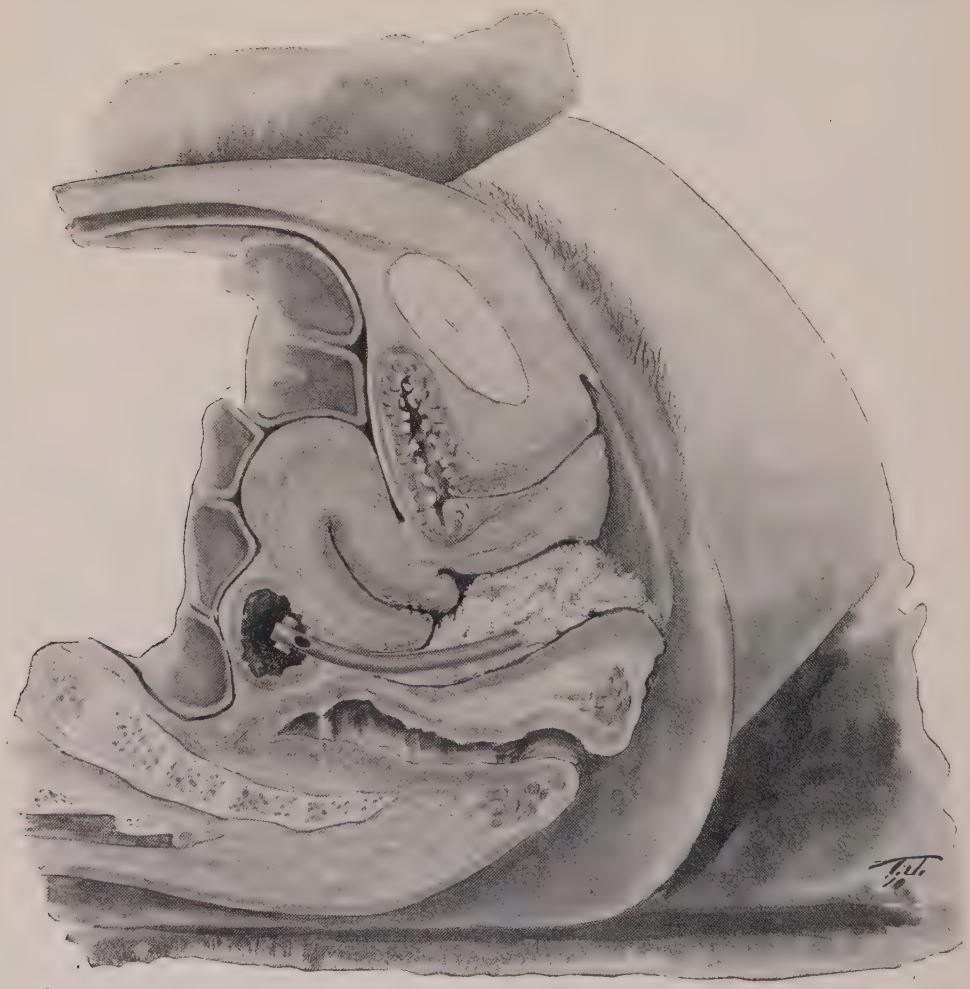


Fig. 617. Drainage tube in place. The tube is cut off about midway of the vagina. The gauze packing for checking bleeding in the wound extends into the connective tissue about the tube but not into the abscess cavity.

then introduced into the cavity and its wall explored for secondary pus pockets. If a fluctuating area is found, it may be opened by the finger, dressing forceps or scissors, care being taken to avoid wounding the rectum or mistaking an adherent knuckle of intestine for a fluctuating pus pocket. While an adherent loop of intestine may feel soft and elastic, it never presents the tense fluctuation and

resistance of a pus pocket, unless obstructed. In this palpation of the interior of the abscess cavity, all manipulation should be made gently, so as not to break through the protecting roof of exudate.

5. Drainage. After all pus pockets are opened, a good-sized drainage tube is introduced into the abscess cavity (Fig. 617). The vagina is then cleansed and packed lightly with antiseptic gauze. The upper end of the gauze should be packed rather firmly into the connective tissue about the tube, so as to stop any bleeding there. The gauze is to be packed only a short distance into the wound,

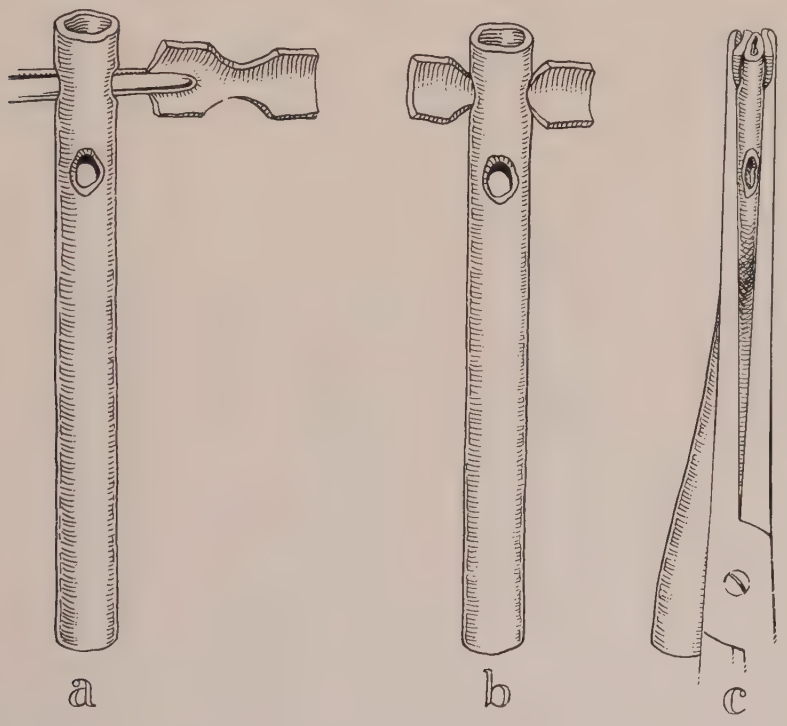


Fig. 618. Showing how to arrange a drainage tube with a small cross-piece at the end to keep the tube from slipping out of the abscess cavity. *a.* A forceps thrust through small holes in the drainage tube and grasping a prepared cross-piece, preparatory to drawing it through the drainage tube. The cross-piece consists of a piece of split tubing trimmed so that it cannot slip out after being drawn through the drainage tube. *b.* The cross-piece in place. *c.* The ends of the cross-piece bent up and caught with a forceps, preparatory to the introduction of the tube into the abscess cavity.

so that it will not pull out the tube when it is removed, for the rubber tube is to be left in place until the cavity is nearly obliterated by granulation, which requires two to six weeks.

The drainage tube will not stay in place without some special device. A very convenient expedient is to introduce a short piece of a smaller tube crosswise through holes cut near the end of the main tube (Fig. 618). This drainage-tube is introduced into the abscess cavity by grasping it with a long forceps as shown

in the illustration. When in place, the forceps are removed and the cross-piece resumes its original position, and thus prevents the tube slipping out of the cavity. When it is desired to remove the tube, slight traction causes the ends of the cross-piece to fold up, and the tube is removed with but little pain. Another method of forming a cross-piece on the tube is shown in Fig. 619.

After the tube is in place, its lower end is cut off at about the middle of the vagina and the vaginal gauze packing is distributed around it. If the tube is allowed to extend outside the vaginal entrance, it causes more or less irritation of the external surfaces, and if it is cut too short it may slip up into the abscess cavity and be lost.

Errors to avoid. One error to avoid is *irrigation of the cavity.* The free opening of the abscess relieves the tension, and this, with the subsequent drain-

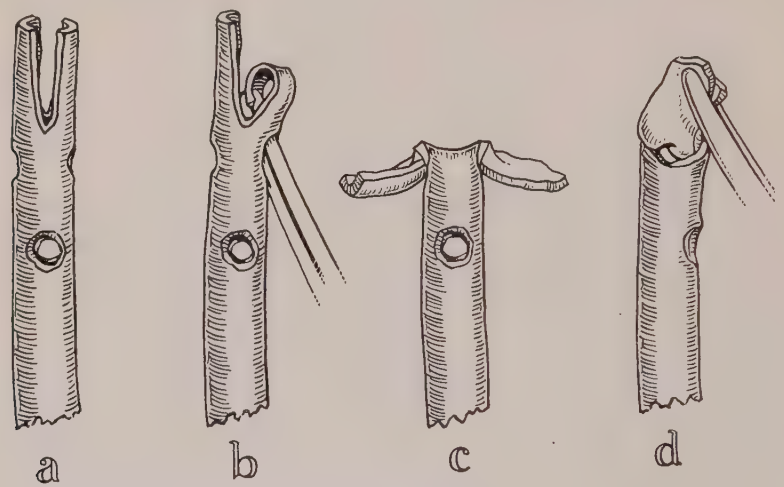


Fig. 619. Another method of arranging the drainage tube to keep it from slipping out of the abscess cavity. *a.* The end of the drainage tube, showing the split in the end and the small opening at the base of each flap. *b.* Drawing one of the flaps through the opening at its base. *c.* Both flaps drawn through. *d.* The flaps bent up and grasped with forceps preparatory to introduction of the tube into the abscess cavity.

age, is all that is required. Furthermore, if a stream of fluid is run into the cavity, it may break through some weak place in the protecting wall and cause infection of the general peritoneal cavity. Irrigation, therefore, is not only unnecessary, but dangerous, and may cause fatal peritonitis in a case that would have recovered promptly under simple drainage.

Another error to avoid is *dependence on gauze drainage.* A considerable proportion of failures and secondary operations are due to this. When there is a distinct abscess cavity, there will necessarily be discharge for some time, and this discharge should find ready exit through the tube drain. Gauze packing is very good for checking bleeding or for holding the tract open for a few days, but it is not satisfactory when prolonged drainage is necessary, and pro-

longed drainage is necessary in practically all cases where a distinctly walled abscess has formed. In the crowded and contracting tissues of the pelvis, tube drainage is the only kind that will keep the drainage tract open satisfactorily and conveniently for the length of time required for a large cavity to become obliterated by granulation. And the best time to place this tube drain satisfactorily is when the patient is under the anesthetic and the abscess just opened.

Variations. In a case of *tubal abscess* where the pus has not yet escaped from the Fallopian tube, the culdesac of Douglas is opened before the abscess proper (tube wall) is reached. The culdesac may or may not be shut off from the general peritoneal cavity by adhesions. In some such cases a small amount of serous fluid escapes when the culdesac is opened. Exploring this nonpurulent cavity, the finger encounters the distended, fluctuating tube, which is then opened, with a resulting free discharge of pus. Two points of importance in such a case are: first, to make a free opening in the wall of the distended tube, and, second, to place the end of the drainage tube inside the affected tube and not simply in the culdesac.

In draining a *broad ligament abscess,* avoid opening the peritoneal culdesac. Such opening is unnecessary and is dangerous, for the uninfected culdesac is not likely to be walled off from the general peritoneal cavity. In operating in a case where the inflammatory mass is situated laterally, the vaginal wall is cut through as before, and then the dissection is directed laterally between the layers of the broad ligament, as indicated by the lateral arrows in Fig. 620. In this way a collection of pus situated even in the upper part of the broad ligament may be drained freely without opening the peritoneal cavity and without injury to surrounding structures. Fig. 621 indicates the forefinger making a path to a pus collection in the left broad ligament, while Fig. 622 indicates the position and relations of the tip of the finger as it pushes into the abscess cavity. Notice the intimate relation to the ureter and to the uterine artery.

In an acute inflammatory mass without pus, it may in certain cases be advisable to drain. In considerable proportion of inflammatory masses operated on promptly, it is impossible to say positively before operation whether or not there is a pocket of pus in the mass. If the general symptoms are threatening and the mass is increasing in size and tenderness, drainage is advisable—on the general surgical principle of immediate drainage of an acute infected focus that nature is failing to limit. In such a case the steps are the same as for a distinct abscess—viz., blunt dissection through the connective tissue, puncture to the center of the mass with sharp-pointed scissors and enlargement of the tract by withdrawing the scissors wide open. The interior of the mass is then palpated with one or two fingers and perhaps opened further in various directions. If no pus is found, the cavity is packed lightly with gauze. As there is no distinct pus cavity, there is no indication for tube drainage. However, if when the gauze is removed after two or three days a free purulent discharge is present (due to an adjacent pus pocket opening into the cavity or to the advancement of the

inflammatory process to the point of suppuration), then a small drainage tube with cross-piece should be introduced at the time the gauze is removed. If no pus is present, no tube drain is required—simply vaginal douches, with or without light gauze-packing of the tract, as preferred. The author has seen, in a

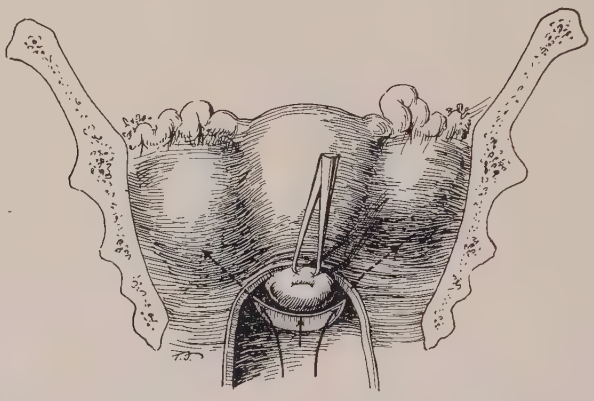


Fig. 620. Opening a Lateral Abscess. After the vaginal wall is cut through, the blunt dissection is carried laterally into the broad ligament of the affected side, as indicated by the arrow. In this way opening of the peritoneal cavity may be avoided.

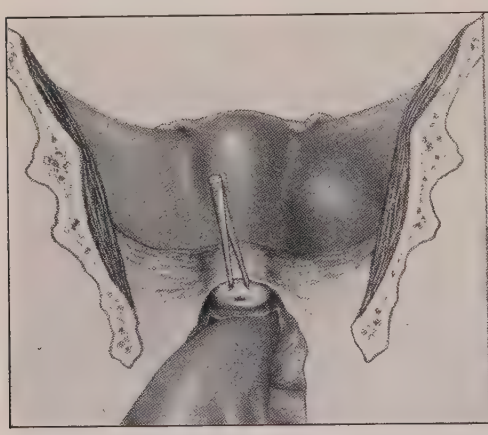


Fig. 621.

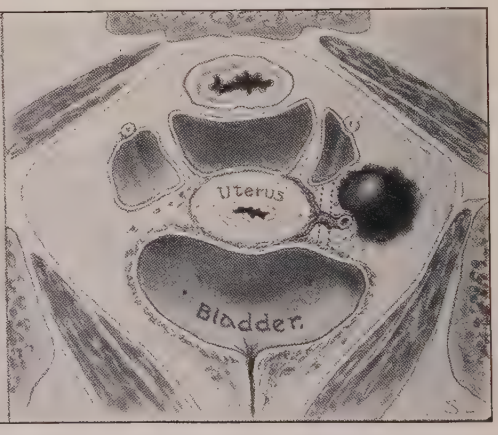


Fig. 622.

Fig. 621. The gloved finger thrust into the opening back of the cervix and directed toward the abscess in the left broad ligament.

Fig. 622. The finger-tip appearing in the small abscess cavity high in the broad ligament. Notice the close proximity of the ureter and of the uterine artery.

number of instances, marked relief from pain and rapid resolution follow this puncture and drainage of an acute inflammatory mass without distinct pus formation.

After-treatment. In the after-treatment of an opened pelvic abscess the two important points are (1) continued free drainage until the cavity has been prac-

tically obliterated by granulation and (2) avoidance of unnecessary irritation, such as repeated packing or probing of the tract or syringing of the abscess cavity.

Neglect of the first point is the cause of the failure in a large proportion of the cases where the abscess reforms and requires secondary operation—that is, when the case has been well chosen and is really suitable for vaginal drainage. The neglect of the second point causes much unnecessary pain and irritation by repeated probing and packing of the suppurating tract, and also contributes to failure by early removal of the well-placed rubber drainage tube, which is the only efficient method of continued drainage in this situation.

The gauze in the vagina is removed in one or two days and after that an antiseptic vaginal douche is given one to three times daily, the frequency depending on the amount of discharge. The patient is kept in bed for a week, and after that, if there is no pain or fever, she is allowed to be up and about. If the tube stops up at any time, it may be cleared out by injecting some hydrogen peroxide into it. If this does not clear it, it is probably stopped by a slough or fibrinous mass. Remove the tube and, after clearing it thoroughly, reintroduce it or a smaller one. For changing the tube or for any manipulation about the opening back of the cervix, the Sims posture is, as a rule, more convenient than the dorsal posture.

The tube should be left in place as long as there is a cavity to discharge—varying in different cases from two to six weeks. If after the large tube has been in for a week the patient complains of pain on bowel movement or other pain in the pelvis, remove the tube and introduce a smaller one. As the abscess cavity contracts, it is necessary to reduce the size of the tube and cross-piece sufficiently to prevent pressure-ulceration of the rectal wall. Continue the douches for at least a week after the tube is removed and all discharge has ceased.

Abdominal Extirpation.

Abdominal operation for an acute pelvic inflammatory mass is to be avoided whenever possible. In the following exceptional cases, however, abdominal operation is indicated:

1. When the diagnosis is doubtful and there is a strong possibility of appendicitis or tubal pregnancy or a suppurating tumor. These conditions as a rule require immediate operation. Therefore, if these conditions cannot be excluded and the patient is growing worse, abdominal operation at once is indicated.

2. In clearly marked salpingitis with surrounding inflammation, if, in spite of palliative measures, the trouble is progressing seriously and threatening the patient's life.

If a *collection of pus,* or a *mass of exudate* that may or may not contain pus, is found high in the pelvis, do not disturb it during the acute attack unless the patient's life is threatened by the severity of the process. Avoid abdominal operation in the primary acute attack if possible. There are two reasons for

this—first, the patient may recover completely under the minor measures (rest, laxatives, hot douches, curettage), and second, if expiration of the mass is finally necessary, it can be carried out later with much less danger to the patient. There is less danger later because collections of pus in the pelvis becomes less virulent after a time. In many old pelvic abscesses the bacteric are dead and the pus is sterile, and extensive contamination of the field of operation fails to cause peritonitis. If, on the other hand, the operation is carried out early while the bacteria are still virulent, contamination of the field is very likely to result in fatal peritonitis.

In mentioning the fact that the majority of inflammatory masses in the pelvis become sterile after a time, attention must be called to an exceptional class—namely, he streptococcal cases. In the streptococcal masses, automatic sterilization or attenuation is uncertain. Though sometimes present, its occurrence can never be counted on. In streptococcal masses the bacteria have been found active and virulent after long periods—even years. Consequently, in these cases intraperitoneal operation is never safe. The persistence of virulence in streptococcal cases, how to recognize such cases before operation, what to do for them when operation is necessary, and other points of interest, are considered in detail under chronic inflammatory masses in the pelvis.

In an acute streptococcal mass situated high and with urgent symptoms, if the pocket of pus cannot be reached and drained per vaginam, it may be possible to drain it extra-peritoneally above Poupart's ligament. This is entirely practicable when the abscess is situated in the broad ligament, as most streptococcal abscesses are, and it has proved a life-saving measure in several instances. The route followed is the same as for ligation of the external iliac artery. In all but exceptional cases, however, an abscess in any part of the broad ligament may be reached and drained satisfactorily from the vagina, by any one familiar with vaginal work.

If the serious symptoms are becoming worse, indicating that the vital forces cannot limit the inflammation and the mass cannot be reached by other method, then the abdomen may be opened, the mass wholly or partially extirpated and drainage instituted. The special details of the extirpation of inflammatory masses in the pelvis (usually infected tubes) are described and illustrated under chronic pelvic inflammation (Figs. 627 to 647).

Peritoneal Drainage.

If the inflammation takes the form of a rapidly spreading peritonitis, with little or no limiting exudate, the peritoneal cavity should be opened and drained, either by vaginal section or abdominal section or both. Such cases are seen principally in pelvic inflammation following labor or miscarriage and constitute a severe type of puerperal sepsis. The inflammation may have extended directly through the wall of the uterus to the peritoneum, or first to the Fallopian tubes and from there to the peritoneum. In either case there is a rapidly spreading

peritonitis of virulent type and the patient is in a desperate condition. There are two methods of dealing with these cases—vaginal section and abdominal section.

1. Vaginal section. The pelvic cavity is opened into by posterior vaginal section and the infected peritoneal fluid allowed to run out. The uterus and appendages are palpated and if a collection of pus is found it is opened. Large rubber drainage tubes are put in (Fig. 623) and the pelvis is packed lightly with gauze, the ends extending out into the vagina (Fig. 623). Washed iodo-

Fig. 623.

Fig. 624.

Fig. 623. Vaginal Drainage in acute pelvic peritonitis. One or two tubes may be used.

Fig. 624. Abdominal Drainage in acute pelvic peritonitis. A glass tube may break, hence a hard-rubber tube as here shown is preferable (see Fig. 805).

form gauze has been recommended for this intraperitoneal packing, but several instances of iodoform poisoning from absorption have been reported. It is safer to use plain gauze wrung out of a weak iodine solution. The principal effect desired is drainage and this is accomplished by the rubber tubes. The gauze packed in the wound about the tubes checks bleeding. It also preserves a good-sized cavity about the tubes, and thus drains the entire pelvis instead of a small sinus, which might be all that would remain if the structures were allowed to collapse about the tubes immediately after their introduction. Gauze is then

packed in the vagina and a large dressing applied over the vulva, and the patient put to bed. The gauze in the vagina may be removed in twenty-four hours, the vagina cleansed and fresh gauze inserted or douches given as preferred. The gauze in the pelvis should be left in place from two to four days, provided there is good drainage during that time. When it is removed care should be taken to avoid disturbing the rubber drainage tubes, which insure good drainage and keep the vaginal wound from closing.

2. Abdominal section. The abdomen is opened by incision in the median line and free drainage made with a glass or hard rubber tube to the depth of the pelvis, as indicated in Fig. 624—with or without removal of affected adnexa as seems best in the particular case.

Of the two methods of pelvic drainage, the first (vaginal section) is the preferable one in the majority of cases of acute virulent pelvic peritonitis if the inflammation is still confined to the pelvis. When the general peritoneal cavity is not involved, vaginal section accomplishes all the important results that can be accomplished by abdominal section—the emptying of pus pockets and free drainage of the infected area—and with much less danger to the patient. Of course, if the infection has already extended to the higher portions of the peritoneal cavity, there may be pockets of septic fluid in the central abdomen which cannot be evacuated from below. Under such circumstances abdominal operation is usually required either alone or in combination with vaginal drainage. In addition to drainage of the infected peritoneal cavity by vaginal section or abdominal section, or both, there are certain other measures of much importance in acute peritonitis—namely, stomach lavage and withholding nourishment by mouth, to prevent injurious intestinal peristalsis; Fowler posture, for drainage; and the introduction of large quantities of normal saline solution into the system, to strengthen the vital organs and aid elimination. These measures are described in detail in Chapter XVI.

Operation for Thrombophlebitis.

In certain cases of acute pelvic inflammation, the inflammatory process is located principally in the interior of the veins. This form of inflammation is found almost exclusively in sepsis following labor or abortion. In these cases there is normally much venous thrombosis, extending from the placental site outward. If these thrombi become infected, there is present one of the most insidious and fatal forms of acute pelvic inflammation, namely, septic thrombophlebitis. As the infected thrombi soften and break down, fresh thrombi form, proximal to the infected area, to shut off the infected area from the general circulation. These fresh thrombi are, in time, invaded by the bacteria, and then other proximal thrombi form. This process may keep on until the large venous trunks become involved—the thrombotic process extending along the ovarian veins to the inferior vena cava or along the uterine veins to the internal iliac and the common iliac.

When the thrombosis keeps well ahead of the infection, the process remains limited. When the infection gets ahead of the thrombosis, the bacteria and pus are poured into the general circulation, producing a state of general pyemia, from which abscesses may result in any part of the body.

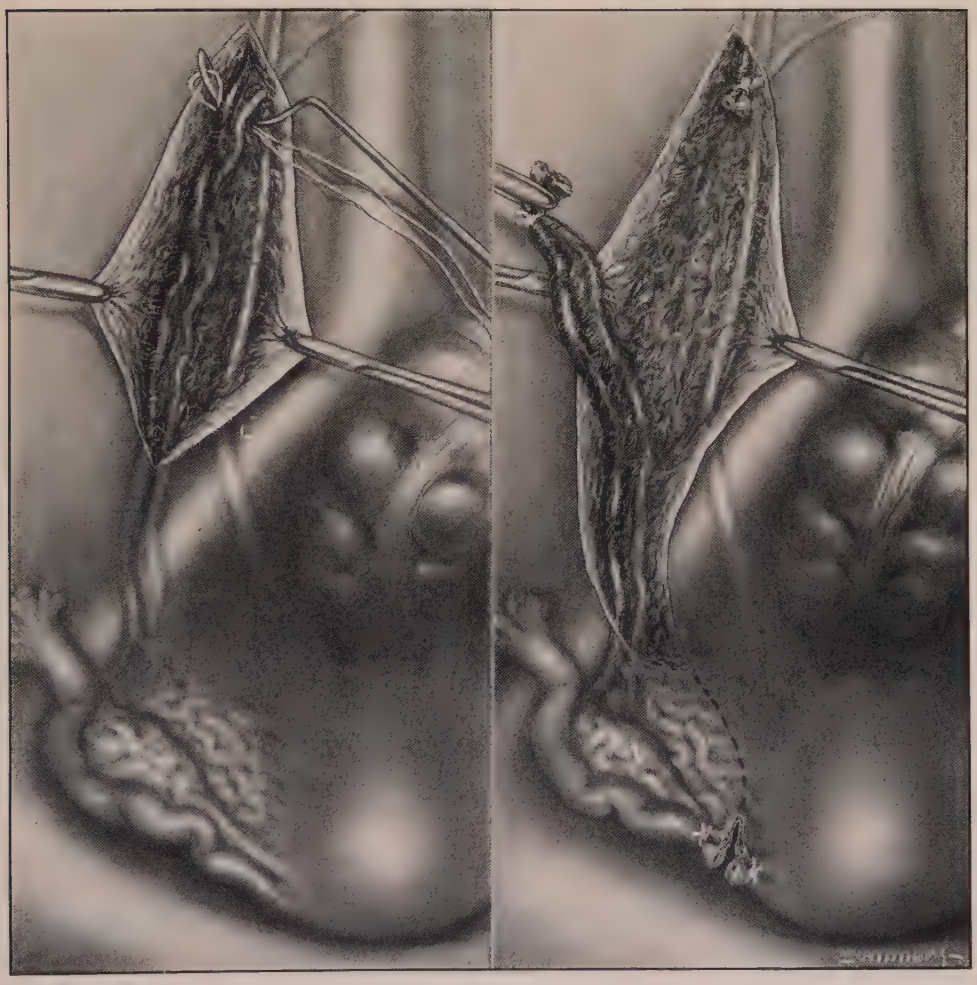


Fig. 625. Fig. 626.

Figs. 625 and 626. Ligation and Excision of Thrombosed Ovarian Veins.

Fig. 625. Showing the affected veins and the upper ligature in place.

Fig. 626. The ovarian vessels ligated above and divided and being separated from the underlying structures. The adnexa and the mass of veins beneath are to be removed as indicated by the dotted line of excision.

Usually there is but little spontaneous pain and not very much tenderness on examination, as long as the process is confined strictly to the veins. Later, the confined suppurative process may break through the vein wall into the surround-

ing connective tissue of the broad ligament. Then the usual symptoms and signs of pelvic cellulitis appear. In such a case, the operative treatment is the same as for a pelvic abscess from any other cause, viz., vaginal incision and drainage.

In certain cases of progressive thrombosis, it is practicable and advisable to ligate the affected veins proximal to the infected thrombus. This can be carried out most effectively in thrombosis of the ovarian veins, on account of their accessibility. In many cases, these are the only veins involved in the thrombophlebitis, for the process starts at the placental site which is usually in the upper part of the uterus.

The technique of the operation is indicated in Figs. 625 and 626. The peritoneum over the affected veins is divided and the veins securely ligated well above the septic thrombus (Fig. 625). The veins are then divided between ligatures, (Fig. 626) and the whole septic portions excised along with the adnexa of that side, as indicated in Fig. 626. The peritoneum is then closed over the involved area.

If the other side is involved, it is treated in the same way. When both sides are involved and the uterus itself badly infected, it may be advisable to remove the uterus also. This is particularly indicated if the thrombophlebitic process involves the uterine veins as well as the ovarian. Such a patient is, of course, in bad condition for any prolonged operation. Consequently the work should be executed rapidly. A supravaginal hysterectomy with posterior division of the cervix for free drainage (Figs. 407 and 408) is a convenient and rapid method of providing the essentials required in such a case, i. e., removal of the septic tissue with free drainage. Operation in such a case may prove a life-saving measure. On the other hand, the additional shock and strain may be sufficient to turn the course of the disease against the patient. Experienced judgment is required in these cases to reach a really helpful decision, both as to the advisability of operation and as to the extent of the same.

Ligation of the lower broad ligament veins (uterine veins) has been attempted in thrombosis involving those veins, but the difficulties are marked and the results, up to this time, have not been such as to commend it.

CHAPTER X.

CHRONIC PELVIC INFLAMMATION

The lesions of chronic pelvic inflammation encountered in operative treatment may be grouped into three main classes, as follows:

1. Chronic salpingitis. This includes, also, the complicating oophoritis and pelvic peritonitis with exudate and adhesions. The lesions in a particular case may be simply a mild salpingitis or salpingitis with exudate or pyosalpinx or diffuse pelvic suppuration or ovarian abscess from the tubal inflammation or hydrosalpinx or nodular salpingitis or adhesions which cause trouble, the tubal inflammation having largely subsided.

2. Chronic pelvic cellulitis. This is known also as parametritis. It may consist of a walled-off pus collection or simply of marked cellular infiltration causing induration and pressure pains.

3. Chronic oophoritis. This class includes the cases of chronic cellular infiltration of the ovary, largely a nutritive change, which eventuates in cirrhosis of the ovary, with or without the usual accompanying cyst formation (cystic ovary).

TECHNIQUE.

The technique of operation varies with the character of the lesion present. The three main classes above mentioned will be considered.

Chronic Salpingitis.

Salpingo-oophoritis. A typical case of chronic salpingitis of moderate severity is that in which the inflamed tube is surrounded by adhesions, which bind the omentum and intestines to the adnexa and uterus. The ovary, also, is usually so much involved in the inflammatory process that it must be removed.

After the abdomen is opened and the character of the trouble definitely determined by exploration, the operation of removal of the adnexa is begun by separating the adherent omentum and intestines to allow access to the affected adnexa underneath. This separation is usually most safely begun at the uterus, which is the main landmark in intrapelvic work. The first step, therefore, is to locate the uterus. Usually enough of the uterus is visible or palpable to permit identification. Occasionally the omentum is adherent to the bladder or the abdominal wall, obscuring everything. In such a case the omentum is traced to its lowest margin and there carefully separated from the underlying bladder, thus exposing the corpus uteri. The conditions are then such as are most commonly found, with the omentum attached to the uterus and obscuring everything beneath (Fig. 627).

The safety and ease of enucleation of such adherent adnexa depend on the selection of the points of attack. The first separation should be made at the junction of the omentum with the uterus, as indicated by the line of crosses in Fig. 627. With the omentum separated from the uterus and pushed up out of

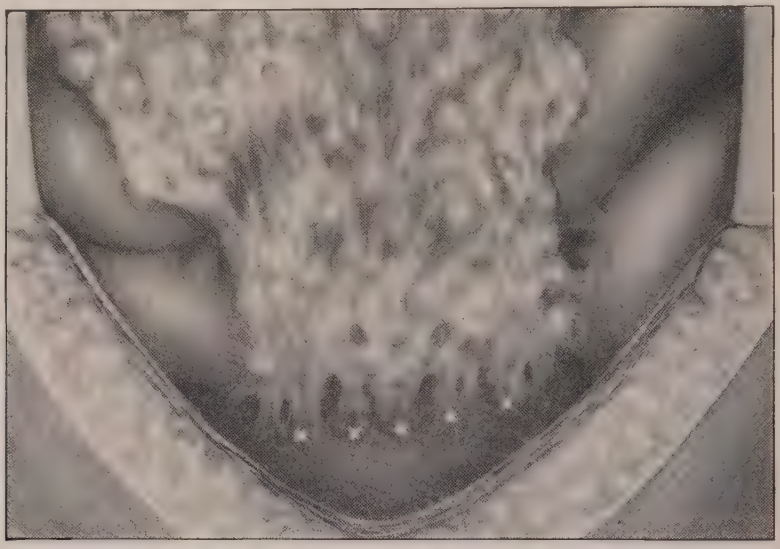


Fig. 627. Abdominal Operation for Chronic Pelvic Inflammation. The first step is to separate the adherent omentum from the bladder in the area marked by the line of small crosses (xxx).

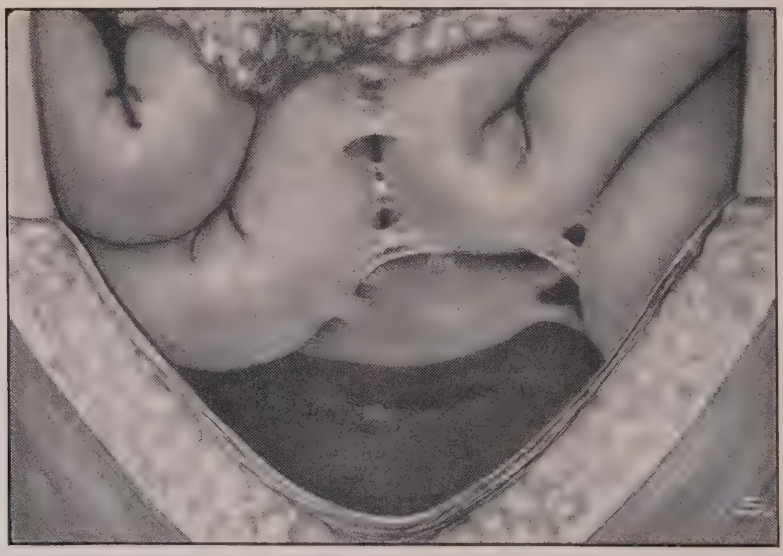


Fig. 628. The intestinal adhesions marked by the small crosses are to be separated, to allow access to the posterior surface of the uterus, which serves as the guide to the further separation of the pelvic structures.

the way, extensive intestinal adhesions come into view (Fig. 628). These are separated sufficiently to allow access to the posterior wall of the uterus (Fig. 629).

It is from fairly low on the posterior uterine wall that the attack on the lateral adherent mass is begun. The fingers, introduced behind the uterus, search for a point of cleavage in the region indicated by the line of crosses in Fig. 629. Having separated the obstructing adhesions and worked the fingers in under the adnexa, the adnexa are further loosened by separating them from the posterior wall of the broad ligament (Fig. 629). The intestinal adhesions are then put on the stretch and separated as shown in Fig. 630.

After the intestinal coils have been completely separated and pushed away, the adnexal mass (disorganized tube and ovary) is drawn up and further isolated

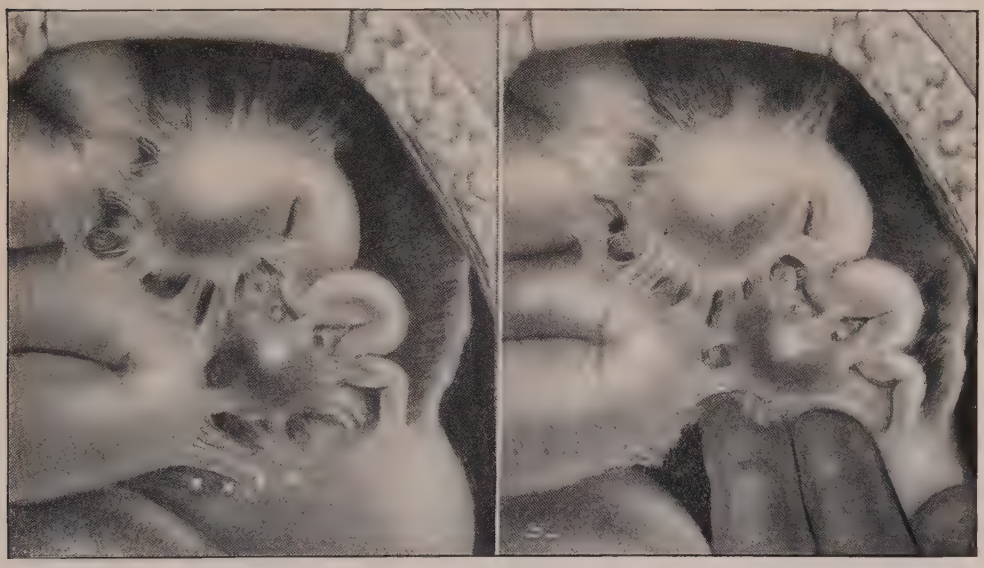


Fig. 629. Fig. 630.

Fig. 629. After the top and posterior surface of the uterus have been cleared of adherent structures, then the adnexa are to be enucleated. This may usually be most satisfactorily accomplished by working laterally from the lower part of the posterior surface of the uterus, beginning in the area indicated by the line of small crosses.

Fig. 630. By working underneath them, the adherent adnexa have been loosened and raised somewhat. This exposes the intestinal adhesions so that they may be more safely separated.

so as to expose its vascular pedicle (Fig. 631). The inner and outer and middle portions of the pedicle are then clamped and divided, as indicated in Figs. 632, 633 and 634.

The outer and inner vessels are ligated, as indicated in Fig. 635, and the thickened stump of the tube is excised into the uterine wall and the wound closed (Fig. 636). The middle portion of the pedicle is simply sutured, which is usually sufficient to check the bleeding there. It is well to use a locked suture,

Fig. 631.

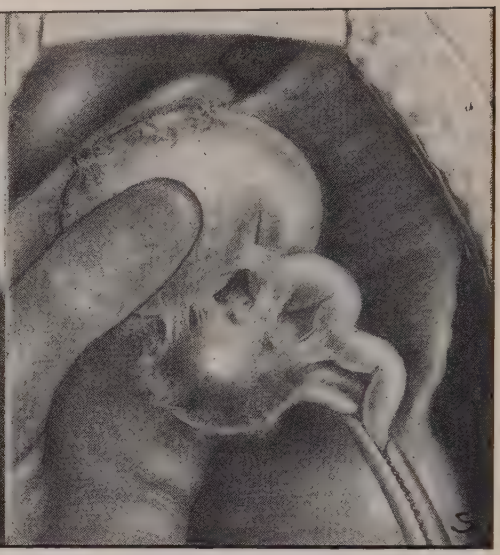


Fig. 632.

Fig. 631. The intestinal adhesions have nearly all been separated, only a few near the pelvic wall remaining.

Fig. 632. The diseased ovary and tube entirely freed down to the vascular pedicles, and the inner vessels clamped. When the adnexa have been freed from the structures to which they are adherent, it is well to stretch the vascular pedicle before clamping it and to make the division of the pedicle near the adnexa—for it is well to have the pedicle long.

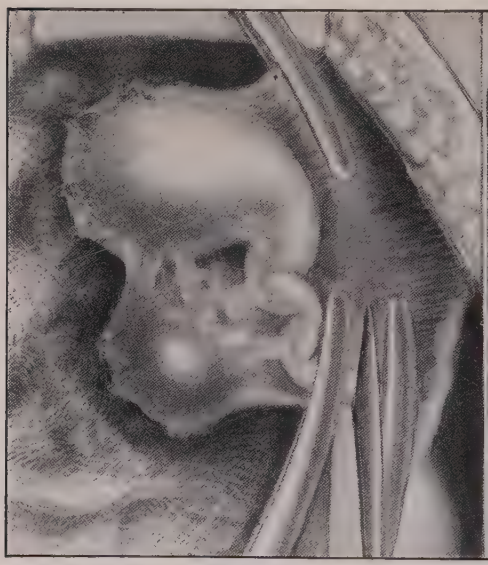


Fig. 633.

Fig. 634.

Figs. 633 and 634. Clamping and dividing the vascular pedicle of the affected adnexa.

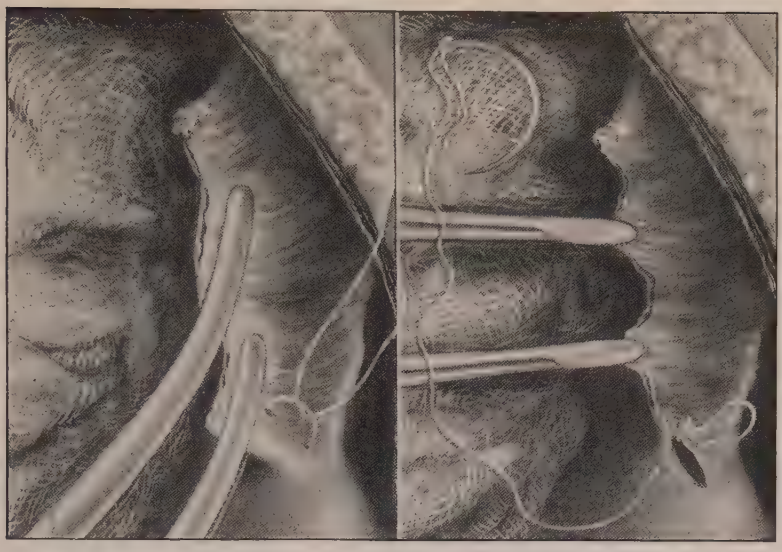


Fig. 635. Fig. 636.

Fig. 635. The outer vessels have been ligated and the inner vessels are being ligated.

Fig. 636. The stump of the tube has been excised and the resulting wound in the uterine wall is being sutured.

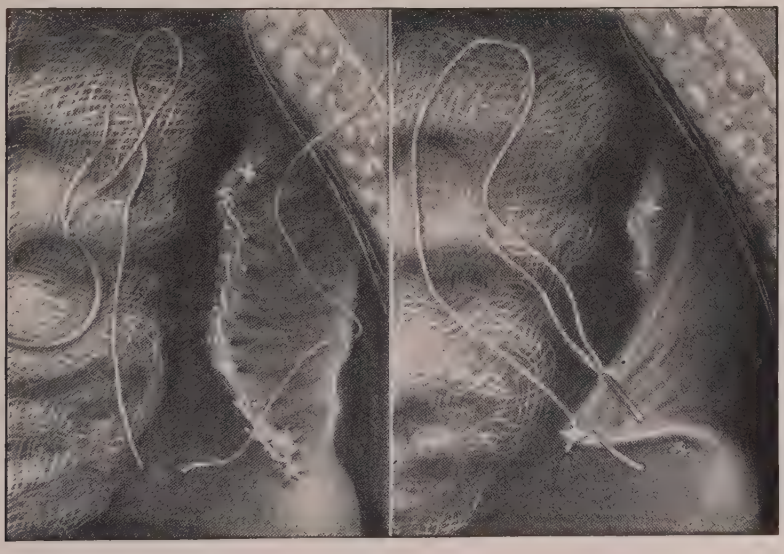


Fig. 637. Fig. 638.

Fig. 637. The suture is in place for drawing the round ligament back of the uterus over the adnexal pedicle.

Fig. 638. The round ligament has been fastened at the edge of the uterus posteriorly, and the proximal portion of the ligament is being sutured to the uterus so as to cover all of the pedicle in that vicinity.

as shown in Fig. 637. If there are any strongly bleeding points, they may be ligated.

If the tissues are lax and the suspensory ligament long, its end may be fastened to the uterine pedicle. This reduces the exposed raw surface to a small area, which is fully covered by bringing over the round ligament as shown in Fig. 638.

If the lateral tissues are short, however, this is not advisable, as it would draw the uterus far to one side and might draw it into a backward position. In such a case the bleeding is checked and the raw edges turned in by locked suture and the round ligament is brought back as shown in Figs. 637 and 638, to hold the uterus forward. The round ligament on the other side is then shortened so as to hold the uterus forward in a fairly even way (Figs. 41 to 44).

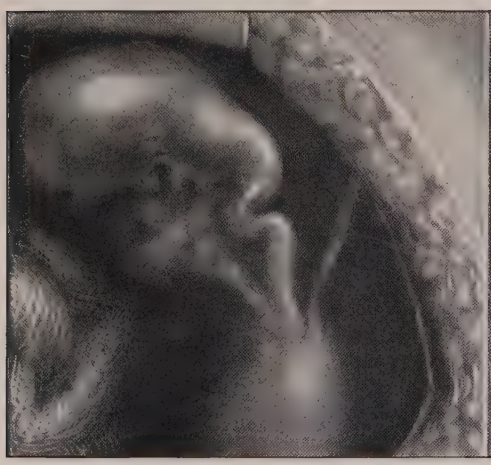


Fig. 639.

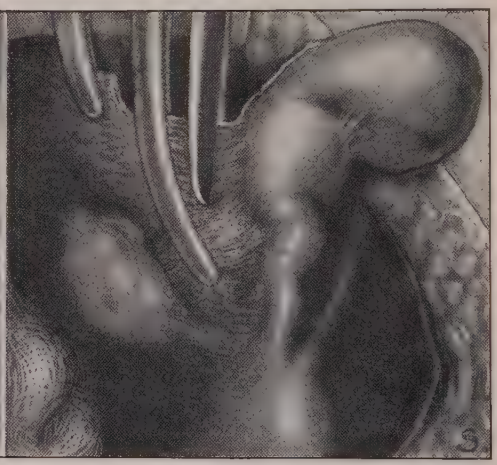


Fig. 640.

Fig. 639. Excision of the affected tube only, leaving the ovary. The adnexa have been freed from adhesions and brought into view.

Fig. 640. The outer vessels of the tube have been clamped and divided, and the middle portion of the pedicle is being likewise treated.

Tube only affected. When the tube only is affected (Fig. 639) and it is desired to save the ovary, the tube alone is removed. The affected tube is loosened and lifted up and the outer part of the pedicle, containing the ovarian vessels, is clamped and divided as indicated in Fig. 640. The middle portion of the pedicle is then clamped and divided (Figs. 640 and 641). The vessels of the inner portion of the pedicle are then ligated, as shown in Figs. 641 and 642, and the tube is excised into the uterine wall (Figs. 642 to 644). The pedicle is then treated as usual (Figs. 645, 646 and 647). If the ovary is inclined to prolapse, the utero-ovarian ligament is shortened by a suture, introduced as shown in Fig. 647. The round ligament is then brought back and fastened, as in Figs. 637 and 638.

Diffuse pelvic suppuration. In such a case the pus has broken out of the tube and lies in spaces between the adherent intestinal coils. As the adhesions are broken these pus pockets are necessarily opened and the pus spread about

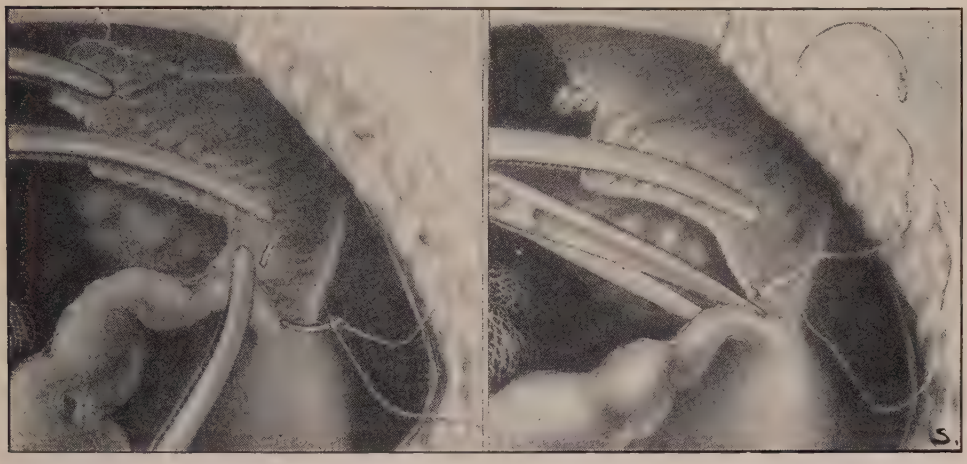


Fig. 641. Fig. 642.

Fig. 641. Passing the suture for the ligation of the inner vessels.
Fig. 642. Excising the diseased tube some distance into the uterine wall.

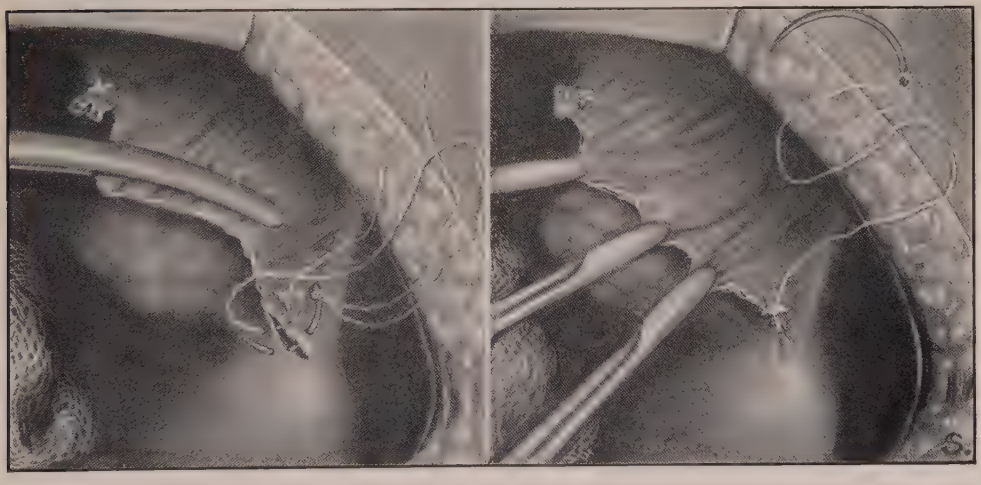


Fig. 643. Fig. 644.

Fig. 643. Closing the wound in the uterine wall.
Fig. 644. The uterine wound closed and the pedicle ready for suturing. The distinct vessels in the pedicle have been clamped.

to a greater or less extent. This necessitates drainage following operation. The drainage may be through the abdominal wound (Fig. 624) or through the culdesac into the vagina (Fig. 623), or, if desired, by both routes.

Aside from the drainage, the steps in the operation are practically the same as already described for an adherent adnexal mass. It is advisable to remove the primary infected mass if possible.

There is an occasional case in which the patient's condition is so bad and the adhesions so extreme and firm that it is not advisable to attempt enucleation of the abscess walls. In such a case, free drainage of all pus pockets is the main reliance, to be supplemented by removal of as much of the infected tissue as is practicable without undue risk.

If the infection spreads after operation, it may be advisable to employ bacterin treatment and other measures for acute inflammation.

Chronic Pelvic Cellulitis.

Effective operation for chronic pelvic cellulitis or parametritis is practicable only when there is a collection of pus to be opened or a hard mass causing pressure symptoms, the absorption of which may be hastened by drainage.

Fig. 645. Fig. 646. Fig. 647.

Fig. 645. Suturing the pedicle. The small vessels may be ligated by locking the suture at those points.

Fig. 646. Inverting the raw edge of the pedicle. The suture is in place for turning in the raw edges of the outer vascular pedicle.

Fig. 647. Shortening the utero-ovarian ligament, to overcome prolapse of the ovary. When the suture, passed as indicated, is tied, the ovary is drawn to the upper part of the uterus.

Connective tissue masses cannot be excised, as can the adnexal. Drainage is the only available method of operative treatment. This drainage can usually be most safely and satisfactorily effected by way of the vagina, by the same methods employed for acute cellulitis (Figs. 614 to 622). The chronic broad-ligament inflammatory masses are very likely to be of streptococcic origin, as explained later, and hence intraperitoneal operation is exceedingly dangerous and should be avoided. Furthermore, as there is no organ in the mass of tissue to be removed, the abdominal route offers no advantage over the vaginal route, where satisfactory drainage can be established by the latter.

Chronic Oophoritis.

The operative treatment of chronic oophoritis (cirrhotic ovary, cystic ovary) consists in (a) excision of the ovary, with or without the tube, or (b) excision of the affected area in the ovary, or (c) puncture of the cysts. The technique of excision of the ovary and tube has already been given (Figs. 631 to 638). Excision of the ovary alone, excision of the cystic area and puncture of the cysts are all considered under conservative surgery of the ovary (Chapter XI).

INDICATIONS FOR OPERATION.

There are two general classes of cases to be considered as follows:

1. If there is a **collection of pus low** in the pelvis, it should be opened and drained by vaginal operation, according to the technique given in detail under acute pelvic inflammation (Figs. 614 to 622). In the after-treatment the drainage tube will have to remain in longer than for an acute abscess of the same size, for the chronic abscesses have thicker walls and hence collapse more slowly.

2. If there is an **inflammatory mass high,** which probably contains pus or which continues to give serious trouble after a thorough trial of the general measures, then abdominal operation must be taken up for consideration. In this connection there arise several important questions. Do some inflammatory masses become sterile after a while? If so, how soon does this spontaneous sterilization take place? How may the masses that become sterile be distinguished from those in which the bacteria remain virulent? All these points and others closely associated are taken up under the following general question:

What is the Preferable Time for Abdominal Operation for a Chronic Inflammatory Mass in the Pelvis?

In a considerable proportion of the cases of chronic suppuration in the pelvis the pus is sterile at the time of operation. In 634 cases examined bacteriologically (collected by Andrews and comprising series by Charrier, Hartman and Morax, Kelly, Koch, Legros, Martin, Menge, Orthmann, Prochownik, Reichel, Schaffer, Schauta, Schenk, Schmitt, Stemann, Strassmann, Wertheim, Westermark, Whiteside, Witte, Zweifel, Rist, Mackenrodt, Durck, Bellei, Walsh, Frommel and Andrews) the results, excluding tubercular cases, were as follows:

Sterile	55.	per cent.
Only saprophytes	6.	per cent.
Gonococcus	22.5	per cent.
Streptococcus and staphylococcus	12.	per cent.
Pneumococcus	2.	per cent.
Bacillus coli communis	2.5	per cent.

In a later resumé, by Hyde, comprising nearly three thousand cases (2,973 cases, excluding tubercular), the bacteriologic findings were approximately as follows: sterile, 1,968; gonococcus, 564; other bacteria and mixed infections, 441.

It is interesting to note the steps in the development of this knowledge. Long ago it was observed that, of the patients subjected to abdominal operation for pelvic suppuration, the old cases usually recovered promptly, while the recent cases frequently developed fatal peritonitis—that is, operation in the acute stage was far more dangerous than operation in the chronic stage.

The splendid advance in gynecologic work in the last few decades is based on facts ascertained in two ways. Some facts came to the surface largely through pathologic and bacteriologic investigation, while others were ascertained by experience at the operating table and the bedside. The fact above referred to belongs to the latter class; it was learned by experience, often bitter experience, and many lives were lost before the lesson was fully learned.

This fact, after having been clinically established, was the occasion of much speculation, as the explanation was not at hand. It seemed paradoxical that long continuance of a debilitating disease should put the patient in better condition for a serious operation for the same.

What could be the explanation? Why did chronic inflammation confer such immunity from peritonitis after operation? One early theory was that the immunity was due largely, if not wholly, to the local effect on the adjacent peritoneum, choking its absorptive channels so that serious septic absorption could not take place so readily and modifying the membrane so that it was not as good culture ground for the bacteria. According to another hypothesis the body resistance generally became "accustomed" to the local irritation in the pelvis and consequently was less disturbed by the added irritation of operation, and also, owing to the preparedness, so to speak, of the general resistant forces of the body, they were better able to combat invasion. These explanations were but gropings in the dark, but nevertheless they contained truths which have been verified and elucidated by the epoch-making investigations into the resistant functions of the leucocytes and the blood-serum, and into the modus operandi of antitoxin and vaccine therapy.

The decisive step in the solution of the riddle was the inauguration of systematic bacteriologic examination of specimens removed in operations for pelvic suppuration. These bacteriologic examinations were undertaken primarily for the purpose of determining the etiology of salpingitis, particularly what proportion of the cases were due to the gonococcus and what proportion to other bacteria. The results were disappointing. In a considerable proportion of the cases no bacteria could be found and hence in those cases the etiology of the trouble could not be bacteriologically determined. But, though disappointing so far as concerned the definite etiological classification of cases, the facts thus ascertained were very illuminating in regard to the important and puzzling question as to why immunity was secured by waiting. In many cases the bacteria had died and disintegrated and the pus was sterile—that was the reason why

serious inflammation seldom followed abdominal section for old tubal abscesses even though considerable pus often escaped among the pelvic structures during the enucleation. On the other hand, in fresh cases the least peritoneal contamination by the contained pus was often followed by fatal peritonitis because the bacteria were not dead, but active and virulent. Another fact ascertained was that in many of the old cases in which bacteria were still present they were so attenuated that the pus was practically sterile.

Persistence of Virulence—Classification of Cases.

It having been established that sterilization gradually takes place within a reasonable time in most cases, the next problem is to determine the period of time required for the automatic sterilization or effective attenuation in the different classes of cases.

The persistence of virulence depends largely on the character of the infection. The two principal infectious agents in pelvic inflammatory masses are the gonococcus and the streptococcus. These two differ widely in the persistence of virulence and also in certain clinical characteristics which can be distinguished before operation.

For the purpose, then, of considering the persistence of virulence in a practical way, i.e., as a guide to treatment, the cases of chronic pelvic suppuration (tuberculosis excluded) may be divided into two classes—the gonococcic and the streptococcic. To be useful, this classification must be made before operation, that is, it must be a clinical rather than a strictly bacteriological classification. Of course, from a bacteriologic standpoint there are other cases, due to other bacteria, but in the present state of knowledge these other cases cannot, as a rule, be distinguished before operation, and, even if they were distinguished, not enough information has accumulated to show the average persistence of virulence in such cases. Consequently, when confronted with a case of nontubercular chronic pelvic inflammation, the endeavor should be to decide whether it belongs to the gonococcic or streptococcic class, ignoring for the time the fact that it may possibly be due to other bacteria, which in point of virulence lie between these two extremes.

How may the gonococcic and the streptococcic cases be distinguished before operation? What diagnostic facts are available at that time? Bacteriologic examination of the urethral or uterine or other discharge is of assistance in only a small proportion of these chronic cases, for as a rule the bacteria have disappeared from the discharge. Hence we must depend on other information obtainable before operation. Fortunately the gonorrhœal cases and the streptococcal cases differ usually in two particulars, namely, (a) in the apparent cause of the trouble, and (b) in the location of the lesion. As a rule these distinguishing points may be settled and the case difinitely classified by an accurate inquiry into the onset of the trouble and a careful bimanual examination.

Uncertain cases are to be classed with one or the other, as the preponderance of evidence warrants, and are to be given treatment accordingly. After operation, bacteriologic examination may show other bacteria, either alone or associated, and, if accurate records are kept of the histories and bacteriologic findings in large series of cases, it may be possible later to form a third clinical class, comprising one or more of the miscellaneous or mixed infections. For the present, however, the two classes, gonococcic and streptococcic, are all that can, as a rule, be satisfactorily distinguished before operation.

Gonococcic Class (Clinical).

In the gonococcic class (clinical) the distinguishing points are (a) that the pelvic inflammation is preceded by evidence of gonorrhœa or comes on without apparent cause and (b) that the lesion is located in the tube, extending thence to the ovary or adjacent peritoneal surfaces but not involving the connective tissue (parametrium) to any decided extent. As so much diagnostic importance is attached to these two points, it is necessary to consider them somewhat in detail.

a. Apparent **cause** or mode of onset. As a general proposition it may be said that the gonococcus is the only germ that will spontaneously invade the normal nonpuerperal uterus and tubes. There are exceptions. Reidel reported that of 56 girls under ten years of age operated on for appendicitis, five had peritonitis due, not to appendicitis, but to acute salpingitis. He states positively that the infections reached the tubes by way of the vagina and uterus, and that gonorrhœo was excluded in every case. Cultures showed the ordinary pus germs. The inflammation was virulent and every patient died in spite of operative treatment. He observed the same clinical picture in two girls past ten years of age, both of whom died. In contradistinction to these cases in children, he states that he has never seen such penetration of normal genitalia by streptococci or staphylococci in the adult.

General experience is in accord with this statement in regard to adults. Purulent inflammation beginning in a normal adult nonpuerperal vagina or uterus, and later extending out into the pelvic cavity, may be set down as almost certainly gonorrhœal. The patient must of course be questioned closely enough to eliminate an early miscarriage and also any intrauterine instrumentation (curettement, intrauterine treatment, sounding in examination, etc.). The probability of gonorrhœa is increased if the purulent discharge (''free leucorrhœa'') began within a few weeks after marriage. Again, in a large proportion of the cases of gonococcal leucorrhœa there is urethritis, causing burning on urination and increased frequency of urination. This discharge and disturbance of micturition may last a few days or much longer. It may precede the pelvic inflammation by a few days or a few weeks or a few months. A history of abscess of one of the vulvovaginal glands has about the same significance as a history of urethritis. These structures are frequently involved in gonococcal leucorrhœa, but very seldom in leucorrhœa from other causes.

In those cases where the vaginal and uterine gonorrhœa did not cause sufficient disturbance to be noticed, the pelvic inflammation began without apparent cause. A considerable proportion of the gonorrhœal cases give such a history. Here, again, one must be careful not to overlook an early miscarriage or some intrauterine instrumentation. Also, it is important to trace the inflammation back to its very beginning, for some cases of puerperal infection are very mild in outward manifestations and do not cause much trouble until there is an exacerbation after several weeks or months. In these cases, however, there is usually a history of some disturbance during the puerperium, from which the patient recovered to a large extent, but not entirely. On the other hand, an inflammatory trouble, at first apparently due to a miscarriage or full-term delivery, may on careful questioning be found to antedate the pregnancy and to be due to a preceding gonorrhœal infection.

In the examination a search should be made about the external genitals for evidences of an old gonorrhœa—signs of previous inflammation of the urethra or of the vulvo-vaginal glands, such as red spots (maculæ gonorrhœa) in these situations, or secretion that can be pressed from the structures. Bacteriologic examination of discharge from the urethra, vulvo-vaginal glands, vagina or cervix may show gonococci. Negative findings, however, do not exclude gonorrhœa, for in many of the chronic causes the causative bacteria have disappeared from the discharge.

In a certain proportion of cases of gonococcic pelvic inflammation the extension of the gonococci into the uterus and beyond took place during the puerperium. It has been shown that the gonococcus may lie practically dormant in the lower part of the genital tract for a long time and extend upward after a labor or miscarriage. Sanger examined 389 pregnant women and found the gonococcus in 100. Steinbuckel examined the lochia in 274 women in which the puerperium was normal and found the gonococcus in 18 per cent. In Leopold's clinic, 25 per cent of the puerperal infections were of gonorrhœal origin. In 179 cases of puerperal sepsis examined bacteriologically by Kronig, 50 cases were gonococcal, 50 belonged to the sapræmic group (miscellaneous saprophytes, most of which did not grow in ordinary culture media) and 79 were due to the ordinary pus bacteria. Puerperal infection due to the gonococcus is nearly always of a mild type, as shown in an instructive article by Taussig. A history indicating that the attack of puerperal sepsis was mild may help some in differentiation, though it must be kept in mind that puerperal infection from other bacteria may also run a mild course. In the cases of puerperal origin, therefore, without positive evidence of gonorrhœa, the decision must rest largely on the location of the lesion.

b. Location of the lesion. The extension of gonorrhœal inflammation is almost invariably along the uterine mucosa into the tube, and any further extension is toward the ovary and the peritoneal cavity. Gonococci very seldom extend through the uterine wall into the parametrium. Even when they do extend into the connective tissue, they are not likely to form an inflammatory mass there.

Steinschneider and Schaefer injected pure cultures of gonococci into connective tissue, but no decided inflammatory action resulted. Though parametrial abscess may occasionally result from gonococci, as demonstrated by Wertheim and others, it is so rare as to be a curiosity.

The characteristic lesion, therefore, of gonorrhœa in the pelvis is pyosalpinx, with or without the complicating oophoritis and pelvic peritonitis. The great majority of all pus-tubes are due to gonorrhœal infection, known or unknown. In 106 cases of purulent salpingitis examined by Menge the findings were as follows: sterile pus in 69, gonococci in 22, tubercle bacilli in 9, staphylococcus in 1, anaërobic bacteria in 2, streptococci in 4. As we shall see later, the gonococcus often dies out within a comparatively short time, so it is probable that most of the sterile cases originate from the gonococcus. When this fact is taken into consideration it becomes apparent what a large proportion of the cases of purulent salpingitis are due to the gonococcus and what a small proportion to other bacteria.

In an article on this subject some years ago (Surgery, Gynecology and Obstetrics, October, 1919), the author gave the details of a series of cases of the gonococcic class (clinical), showing the two principal diagnostic points before operation, the interval of time from infection to operation, the bacteria found at operation, and the degree of virulence (as indicated by the result of the operation).

The cases thus tabulated in detail may be taken as typical of the hundreds of cases of this common class, which include probably five-sixths of the chronic inflammatory masses in the pelvis. These cases are so common and run such a uniform course that but few are reported in sufficient detail to show definitely the apparent cause, the interval of time from infection to operation, the location of the lesion and the bacteriological findings. It would be well if several series from the larger clinics were reported, showing the points mentioned, so that the pre-operative diagnosis of the character of the infection and the probable virulence may be more clearly defined.

It will be noticed in the article mentioned that in some of the cases belonging clinically to the gonococcic class, bacteriologic examination showed other bacteria instead of the gonococcus. But they are placed in this clinical class because of the apparent cause and the location of the lesion—the only decisive information usually obtainable before operation. It is only by such careful classification of the cases before operation and careful bacteriologic examination after operation, that a useful classification can be established and errors gradually eliminated.

The lessons to be drawn from the consideration of the cases of the gonococcic class (clinical) may be stated briefly under three heads, as follows:

Reliability of the Diagnostic Points Available before Operation. From the cases above cited, which are typical of the hundreds belonging to this class, it is evident that the two points mentioned (the apparent cause and the location of the lesion) may be depended upon to eliminate the virulent streptococcal cases.

Where these two clinical signs agreed, bacteriological examination of the pus found showed either the gonococcus or absence of bacteria, with but one exception. This exceptional case was rather acute and appeared gonorrhœal. The trouble began shortly after marriage with a purulent vaginal discharge and local irritation. The discharge was not examined bacteriologically. An adnexal mass appeared on each side and extended into the culdesac. The pus pockets in the pelvis were evacuated by vaginal incision. Pus was found in the culdesac and in both tubes. It was supposed to be gonorrhœal. Bacteriologic examination showed pneumococci in abundance, but no gonococci. In the cases where the two points did not agree, there were various bacteriological findings. In uncertain cases the location of the lesion was principally depended upon for classification. Except where the trouble was clearly from puerperal sepsis, a marked tubo-ovarian mass without parametrial involvement admitted the case to this clinical class. In no instance did such a case show streptococci.

In the cases due to puerperal sepsis great care should be exercised in excluding streptococci before admitting the case to the gonococcic clinical class. The apparent location of the lesion helps, but cannot be depended upon entirely in these puerperal cases. A few cases showing streptococci presented masses at first supposed to be purely adnexal. Most of these, however, on more thorough examination at the time of operation, showed that the process was located partly in the connective tissue. Streptococcal pyosalpinx without associated parametritis is certainly very rare. Miller, who reported a number of streptococcal infections and investigated bacteriologically more than a hundred cases of pelvic inflammation at Johns Hopkins Hospital, stated that he had never encountered a frank pyosalpinx due to the streptococcus. Whiteside and Walton, in a series of thirty cases of pyosalpinx examined for bacteria, found the streptococcus in three, but the question of coincident parametrial involvement does not seem to have been investigated. In a series of 106 cases of suppurative salpingitis, Menge demonstrated the streptococcus in 4, but nothing definite is said as to the parametrial involvement in these cases.

Persistence of Virulence. In the clearly gonococcic cases the bacteria were found to be absent or attenuated, as a rule within two to four months after infection. In some cases gonococci were found after several months or a year or even several years, but they had lost their virulence. Hartman and Morax state that all their specimens showing gonococci were from patients with rather recent inflammation, the duration of the trouble varying from three weeks to four months, and averaging four to five weeks.

Gonococci may die and disappear within a few weeks. In two cases detailed, where examination of the pus showed it to be sterile, the duration of the trouble was only two months in one case and five weeks in another. Gonococcic pus confined in the tube may become sterile in six or eight weeks, but it may, on the other hand, continue active for a considerably longer time. Radical operation, therefore, should ordinarily be postponed to at least three months from the onset of the trouble.

Why Wait for Sterilization or Attenuation in Gonococcal Cases? There are two reasons. In the first place, a considerable proportion of the pelvic inflammatory masses disappear without operation if Nature is given a chance for three or four months. Many cases of supposed pyosalpinx so recover. The expression "supposed pyosalpinx" is used advisedly. The author does not care to enter into the controversy over the possibility of the spontaneous cure of pyosalpinx, hence the statement is limited to the inflammatory masses *supposed* to be pyosalpinx, of which a considerable proportion disappear when nature is given a reasonable chance.

The second reason for waiting for automatic sterilization or effective attenuation of the pus within the quiescent mass, is that active gonorrhœal pus is by no means harmless. General peritonitis due to the gonococcus is not so rare as formerly supposed. Hunner and Harris collected eighteen cases supported by bacteriological proof, and seven of these patients died. They found also twenty-one cases in which, though bacteriological proof was lacking, the clinical evidence indicated strongly that the peritonitis was gonococcal, and five of these patients died. Again, peritonitis is not the only danger from operation on a quiescent but still active collection of gonorrhœal pus. Price reports a case in which such an operation caused general dissemination of the bacteria with involvement of the joints and endocardium and finally death fifteen days after the operation. There was no evidence of peritonitis. A number of cases of general dissemination of the gonococcus have been reported. Hunner cultivated gonococci from the blood taken from the arm of a patient five days after abdominal section for supposed gonococcal peritonitis, and in a fatal puerperal case Harris and Dabney demonstrated gonococci on the valves of the heart.

Streptococcic Class (Clinical).

The distinguishing characteristics are (a) the apparent cause of the trouble and (b) the location of the lesion.

a. Apparent cause. Nearly all the streptococcic inflammatory masses in the pelvis can be traced to sepsis following labor or miscarriage. In the adult, streptococci do not spontaneously penetrate the nonpuerperal uterus. Aside from labor or miscarriage, streptococcus infection may be due to curettement or other uterine operation, to intrauterine application or sounding, to a stem pessary, or to conditions caused by carcinoma or fibroid or chronic inflammation. If a pelvic inflammatory trouble cannot be traced to one of the causes above mentioned, it is almost certainly not streptococcic. In taking the history, care must be exercised not to miss an early miscarriage or an intrauterine treatment. Care must be taken also to trace the trouble back to its very beginning, otherwise an exacerbation remote from the causal miscarriage or labor may be mistaken for the beginning of the trouble.

On the other hand, not all puerperal cases are streptococcic. About twenty-five per cent of puerperal infections are gonococcal. They are usually of a mild type and subside quickly, but it must be kept in mind also that other puerperal

infections (staphylococcic and even streptococcic) may run a mild course. Consequently the mildness of the preceding septic attack must not be given too much weight. Outside of external evidences of gonorrhœa (about the vulva or in the discharge), most dependence is to be placed on the location of the lesion. Streptococcus lesions are usually parametrial, while gonococcus lesions are usually tubo-ovarian.

Another complicating factor in these puerperal cases is that there may be a mixed infection, causing both kinds of lesions to be present. Stone and McDonald reported such a case. This case furnished also a beautiful and striking illustration of the fact that the gonococcus spreads by way of the mucous membrane and the streptococcus by way of the connective tissue. The gonococci occupied the right tube and extended thence into the peritoneal cavity, while the streptococci occupied the right broad ligament and extended thence into the peritoneal cavity, where the two forms of bacteria met. Another possibility in these puerperal cases is that the two forms of bacteria may be mixed in one lesion—e.g., in a pyosalpinx. This is evidently very rare, but it has occurred, and the possibility of it should make us always suspicious of a post-puerperal inflammatory mass wherever located. In such a case the evidences for and against the presence of streptococci should be most carefully canvassed before deciding to subject the patient to abdominal section.

b. Location of the lesion. A chronic lesion in the pelvis of streptococcic origin is nearly always in the connective tissue (parametrium). Unlike the gonococcus, the streptococcus does not progress along the mucosa into the tube, but penetrates the wall of the uterus and extends into the connective issue. It not infrequently extends from the connective tissue to the peritoneum, causing peritonitis. Of course, in exceptional cases streptococci may pass from the uterus into the tube, but in such cases they are likely to pass on through the tube and cause fatal peritonitis. Consequently, in the streptococcic cases that survive the acute attack and come later for treatment for an inflammatory mass, the lesion nearly always involves the connective tissue (parametrium). As before mentioned, Menge found the streptococcus in four cases of pyosalpinx, while Whiteside and Walton found it in three, but parametritis was not excluded. The last mentioned authors endeavored to produce streptococcus salpingitis experimentally by injecting into the uterus in rabbits pure cultures of streptococci and also mixed cultures of streptococci and staphylococci. In no instance did salpingitis result. One rabbit died of acute streptococcus septicæmia, while the others simply developed a purulent vaginitis for a few days and then recovered, and when replaced in the rabbit pen became pregnant and bore litters of six rabbits each. Miller, in the bacteriological examination of 127 cases of pelvic inflammation, found the streptococcus 7 times, but in no case was the lesion a pyosalpinx alone. There are very few exceptions to the rule that streptococcal masses in the pelvis are parametrial in whole or in part.

Are all parametrial inflammatory masses streptococcic? Nearly all. That parametrial suppuration is usually due to the streptococcus is substantiated by

Rosthorn, Bumm, Doleris and Bourges, West, Cullingworth and others. Hartman and Morax found it in 21 cases of parametrial abscess. In every such case operated on by Fritsch the streptococcus was found to be the cause. It is only occasionally that staphylococci and other bacteria are found either alone or associated with the streptococcus. As parametrial inflammation is nearly always due to the streptococcus, every case presenting a parametrial mass should be placed in the streptococcic class until it is definitely proved to be due to some other cause.

The distinguishing characteristics of a parametrial mass (chronic) are: (a) its situation in the connective area, usually in the broad ligament; (b) its low situation in relation to the uterus, often coming far down beside the cervix; (c) its intimate blending with the uterine wall, as though it were a part of the same; (d) its intimate blending with the pelvic wall, as though it were an outgrowth from that structure; and (e) its hardness, often being so hard as to simulate a cartilaginous or bony tumor growing from the pelvic wall. A tubo-ovarian mass, on the other hand, is distinguished by its being situated high in the tubo-ovarian region, or prolapses into the culdesac; by its not blending so intimately with the uterine wall, a distinct groove usually marking the point where the two come in contact; by its not blending so closely with the pelvic wall; by its presenting to the examining finger a portion of the rounded outline of the tube or ovary; and by absence of the cartilaginous hardness often seen in chronic parametrial masses.

In the article previously mentioned the author gave the details of a series of cases of the streptococcic class (clinical), showing the two principal diagnostic points before operation, the interval of time from infection to operation, the bacteria found at operation and the degree of virulence, as indicated by the result of the operation.

From this series of cases of the streptococcic class (clinical) the following facts may be adduced.

Reliability of the Two Diagnostic Points Available before Operation. When the history showed that the trouble originated from labor or abortion and the examination showed a well-marked parametritis, streptococci were found in every case except one. This one exception (case 16) was Hunner's case and he was not altogether satisfied with the bacteriologic examination, but stated that he regarded the case as streptococcal in spite of the negative findings.

When the two points do not agree, then the principal weight should be given to the location of the lesion. But not a sufficient number of carefully observed cases has accumulated to define accurately how great a dependence may be placed on the location of the lesion in these uncertain cases. This is a point to be further investigated. For the present these uncertain cases should be considered with great care in order that no streptococcic case be allowed to slip into the gonococcic (abdominal section) class.

Persistence of Virulence. The virulence of the streptococcus persists indefinitely. Miller reports one case in which the bacteria persisted for six years and another in which they persisted for twelve years. Martin states that strepto-

cocci have been found fully virulent in a pelvic inflammatory mass after nineteen years. In one instance (case 19) streptococci apparently disappeared in six months, but the pus also disappeared. The case was one of severe sepsis following labor. On the eighth day vaginal incision into a pelvic abscess evacuated pus containing streptococci. Six months later, a mass persisting, a vaginal incision was made into the culdesac and the mass. No pus was found, but there was serous fluid showing staphylococci alone.

Automatic sterilization of a streptococcus abscess is perhaps possible, but it is so rare that it is not to be counted on. A streptococcal mass in the pelvis is always dangerous, and abdominal section for the same at any time is likely to be followed by a fatal peritonitis. The cases tabulated in the article mentioned give striking proof of the seriousness of intraperitoneal operation in these cases.

Character of operation. The only safe way to operate for streptococcal pus collections is by the extraperitoneal method. If possible, the pus collection should be reached and evacuated per vaginam. If this cannot be accomplished, it may be practicable to drain the abscess by extraperitoneal operation above Poupart's ligament, as was done in some of the cases mentioned. Intraperitoneal operation in these cases should be undertaken only when the patient's life is threatened by the severity of the inflammation and it is impossible to reach the mass in a less dangerous way.

Conclusions.

1. In more than half of the cases of chronic suppuration in the pelvis the pus is sterile at the time of operation, showing that sterilization of the infected focus takes place automatically within a reasonable time in the majority of cases.

2. Abdominal removal of the mass while the bacteria are active and virulent results in fatal peritonitis or localized infection in many of the cases. Abdominal removal of the mass after the bacteria are dead or greatly attenuated is almost never followed by infection, even though there is extensive escape of pus into the pelvis. Hence abdominal operation for a chronic inflammatory mass in the pelvis should not be undertaken before the period of probable sterilization, except in those rare cases in which, in spite of palliative measures, the patient's life is threatened by the severity of the inflammation and the infected focus can not be satisfactorily drained extraperitoneally.

3. The time required for the death of the bacteria or effective attenuation of the same varies greatly in different cases. The persistence of virulence depends largely upon the character of the infection. The two infections concerning which definite information has accumulated as to persistence of virulence are the gonococcal and the streptococcal.

In the gonococcal cases the bacteria are dead or attenuated to practical sterility within three or four months from the beginning of the trouble. In such cases abdominal section may be safely undertaken after this period. In the streptococcal cases, on the other hand, the bacteria live and retain their virulence indefinitely. In some cases there seems to be a diminution in the virulence, but this is

erratic and not to be depended upon. Abdominal section for a mass of streptococcic origin is never safe. Such an operation at any time, even years after the infection, is liable to be followed by fatal peritonitis.

4. These two classes may be distinguished before operation in most cases, the distinguishing characteristics of each being found in the **apparent cause** of the trouble and the **location of the lesion,** as already explained in detail.

5. What is the preferable time for abdominal operation for a chronic inflammatory mass in the pelvis? This varies in different cases, as follows:

a. In a case that is clearly gonococcic (agreement on the two points—the apparent cause of the trouble and the location of the lesion) abdominal operation may be considered safe after three or four months from the onset of the trouble. If after this time the mass is a source of serious irritation in spite of palliative treatment, it should as a rule be removed. On the other hand, if there is marked improvement, it is better to wait, as Nature may bring about recovery without operation.

b. In a case that is clearly streptococcic (agreement on the two points) abdominal section is never safe. Even where the temperature and pulse are normal and everything quiescent, intraperitoneal operation for the mass is liable to cause the patient's death from streptococcal peritonitis.

c. In a case that is doubtful (disagreement on the two points) a most careful study should be made of all the features of the case and every helpful diagnostic method should be brought into use to aid in reaching a positive conclusion. No intraperitoneal operation should be undertaken until the streptococcus is excluded with reasonable certainty. In a doubtful case in which the abdomen is opened on the supposition that the mass is tubo-ovarian and it is found before adhesions are most disturbed that the mass is principally in the connective tissue (parametritic), the route of attack should be changed to extraperitoneal (per vagina or above Poupart's ligament) and the abdominal wound closed. Such a lesion probably contains streptococci and the adhesions of omentum and bowel, which cause the deceptive mass high in the tubal region, constitute Nature's barrier between the virulent bacteria and the peritoneal cavity. When this barrier is broken down, the way is opened for a fatal peritonitis.

CHAPTER XI.

CONSERVATIVE SURGERY OF OVARIES AND TUBES.

By the term "conservative surgery" is meant the conserving or saving of undiseased portions of ovaries and tubes or of portions that are somewhat affected but not enough to threaten serious trouble should they be left. A "conservative operation," then, is an operation that saves an organ or part of an organ that would otherwise (by the regular radical operation) be wholly removed. Conservative surgery of the ovaries and tubes is of rather recent development, and in order to present it in its proper relation the steps preceding it will be briefly recalled.

Before the eighteenth century, operation for the removal of ovarian tumors had been suggested by a number of physicians, but it had never been put into practice. Later, the celebrated John Hunter and the equally celebrated John Bell both advocated the operation, but neither of them ventured to perform it.

The first ovariotomy in the world was performed by Ephraim McDowell, a native of Virginia, practicing in Kentucky. McDowell had attended the lectures of John Bell in Edinburgh in 1749, and was convinced of the correctness of his teacher's views in regard to the removal of ovarian tumors. He returned to Kentucky and practiced his profession without special incident until 1808, when he was confronted by a case of ovarian tumor requiring operation. After giving the matter careful consideration and making full explanation to the patient, he performed the operation, and the patient recovered. From that time the practice gradually spread over the civilized world, and after half a century ovariotomy became comparatively frequent. The ovaries were removed, not only for tumors, but for all sorts of ovarian diseases, from the most serious to the most trivial. In fact, it became quite common, later, to remove practically normal ovaries for various nervous disturbances which it was thought might be due to them(Battey's operation).

After a time, however, it began to dawn upon the profession that the ovaries had another function than ovulation, and that when the ovaries were removed the patient was deprived, not only of ovulation, but also of some factor which had a marked influence on the general health. Gradually the trophic function of the ovary was worked out. From the facts thus far established we know that, aside from the consideration of ovulation or pregnancy, an ovary should be preserved, wherever possible, on account of the influence it exerts over the patient's health, particularly over her nervous system.

The objects for which conservation of the ovary and tube or reimplantation of ovarian tissue are practiced are four, as follows:

1. Preservation of the possibility of **pregnancy.** To make pregnancy possible, there must be one ovary or a functionating piece of one ovary, and a patent tube. The patent tube may be on the same side as the ovary or on the opposite side. It may be a normal tube or it may be simply the stump of a tube, the remainder of the tube having been removed on account of some disease.

Under all these circumstances pregnancy is possible and has taken place in a number of instances. Of course, it is not as likely to take place as in a normal individual, but still the patient has a chance of becoming pregnant. Another point, sometimes overlooked, is that even though no pregnancy results from these efforts at conservatism, the simple fact that the patient *may* become pregnant—that pregnancy is still possible—conduces much to her peace of mind.

2. Continuation of **menstruation.** Even though the hope of pregnancy must be sacrificed on account of disease necessitating the complete removal of both tubes, if an ovary or functionating piece of an ovary can be left in the pelvis with the uterus, menstruation continues.

3. Continuation of the **trophic influence** of the ovary. When the uterus must be removed, pregnancy and menstruation are of course no longer possible. However, if an ovary or a functionating piece of an ovary can be saved, the trophic influence of the ovary is preserved, provided that the retained portion of the ovary continues its function—that is, continued to form ova and corpora lutea.

The latter fact must be kept in mind. The mere leaving of a portion of the ovary does not insure a continuation of menstruation or of the trophic influence. To produce the desired result, the portion of ovary left must continue to functionate. If its nutrition is so interfered with that ovulation does not continue, it is just the same as though no ovarian tissue had been left. Some time ago there came to the author a woman who had been operated on in a distant city. The operator had told her that she would menstruate, as part of one ovary had been left in place. Menstruation, however, ceased entirely after the operation, and when the author saw the patient she was suffering from the symptoms of the artificial menopause. She was inclined to think that both ovaries had been completely removed and to blame the operator for "deceiving" her. It was evidently one of those cases in which the portion of ovary preserved had not survived in condition to continue its functions, and the patient's confidence in her former physician was restored by this explanation.

4. Reestablishment of the **trophic influence** of the ovary. In certain exceptional cases the patient's nervous system goes to pieces in the absence of the ovarian trophic influence, owing to the removal of the ovaries by operation or their destruction by disease. Efforts have been made to rescue such patients from this serious condition by the transplantation of ovarian tissue from one individual to another. There has been partial success, enough to warrant further trial in those exceptional cases of severe disability which is due to the lack of ovarian influence and which persists in spite of a thorough trial of ovarian and lutein products administered internally.

TECHNIQUE AND INDICATIONS.

Preservation of Possibility of Pregnancy.

For the preservation of the possibility of future pregnancy, there must be a uterus, a patent tube and functionating ovarian tissue.

Ovarian disease. There are several affections of the ovary that permit conservative operative treatment.

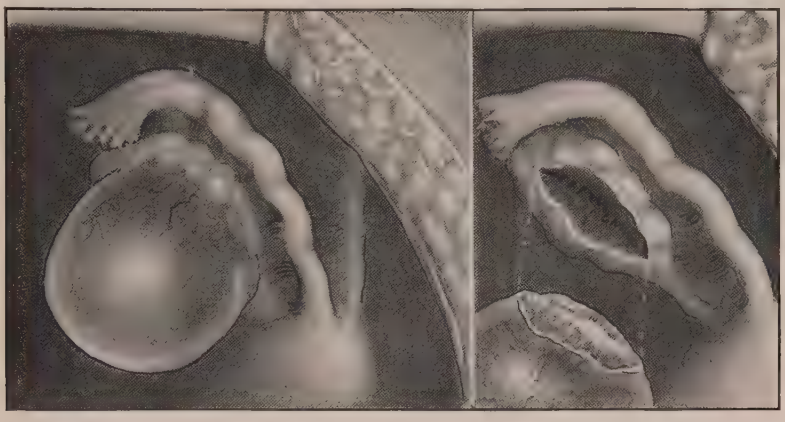


Fig. 648. Fig. 649.

Fig. 648. A cyst of the ovary which may be removed without sacrificing the ovary.
Fig. 649. Showing the wound in the ovary resulting from the excision of the cyst.

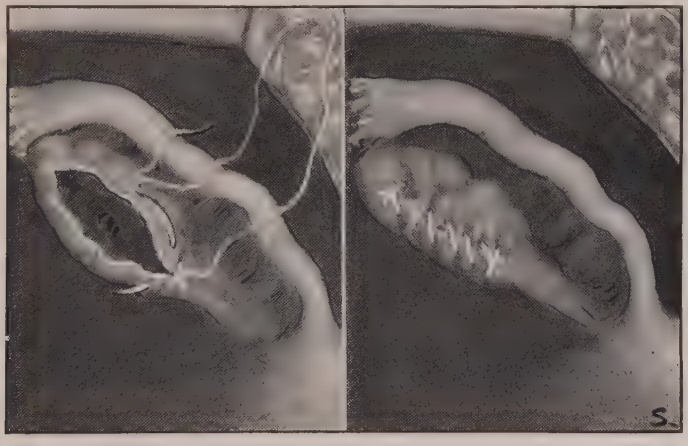


Fig. 650. Fig. 651.

Fig. 650. Beginning the suture-row which is to check oozing and close the wound in the ovary.

Fig. 651. The wound closed. A second suture-row may be used if necessary to turn in all raw edges. Usually, however, this may be accomplished with the one suture-row if the edges are pushed in as the sutures are drawn down. Occasionally one or more deep ligatures are needed for bleeding vessels.

Excision of small ovarian tumor. A small ovarian tumor having a considerable mass of ovarian tissue at its base (Fig. 648) may be removed, leaving the ovarian tissue to continue its function. The tumor and point of attachment to the ovary is excised, leaving a wedge-shaped opening in the ovary, as shown in Fig. 649. This opening is then sutured so as to check bleeding and turn in

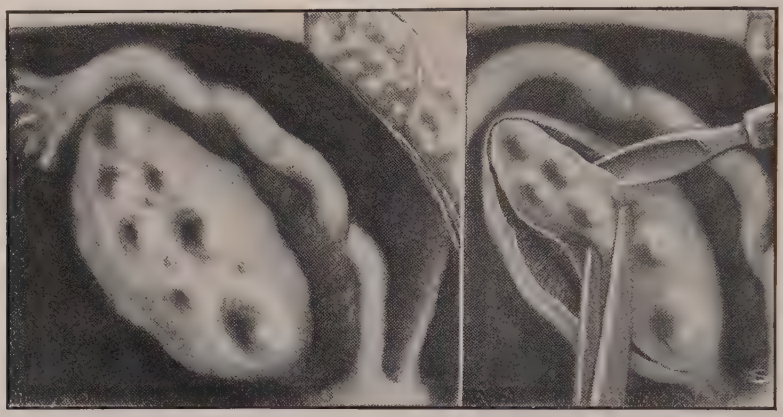


Fig. 652. Fig. 653.

Fig. 652. A cystic ovary with the cysts situated in the central zone.
Fig. 653. Excision of the cystic area.

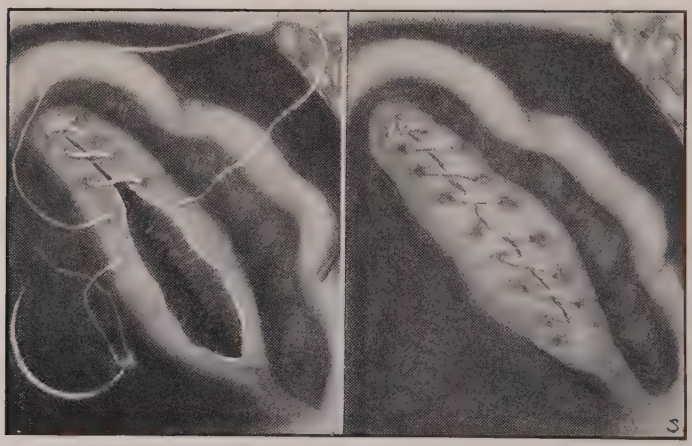


Fig. 654. Fig. 655.

Figs. 654 and 655. Suturing the resulting wound.

all raw edges (Figs. 650 and 651). For the suturing, plain catgut in small size or fine silk may be used, preferably the former. The needle should be slender and round-pointed, so that it does not cut or lacerate the tissue.

Even a small slice of preserved ovarian tissue may continue its activity, providing its blood supply is not interfered with. If the blood supply is interfered

with, the ovarian tissue as a rule undergoes atrophy and disappears. Consequently, whenever an ovary or a portion of an ovary is preserved care should be taken to avoid disturbance of the blood vessels going to the preserved tissue.

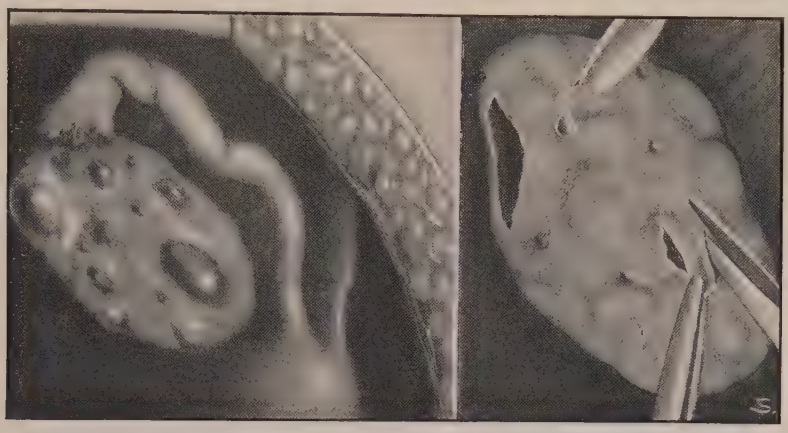


Fig. 656. Fig. 657.

Fig. 656. A cystic ovary with the cysts generally distributed.

Fig. 657. Puncturing the cysts and removing the wall and lining of the large ones. This drawing and the two succeeding ones are made on a larger scale, the better to show the details.

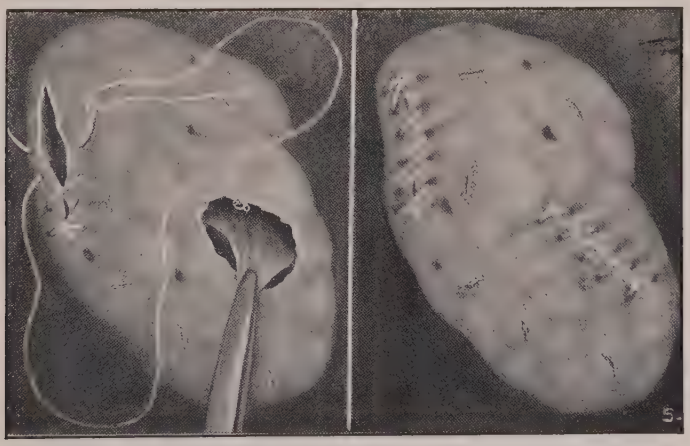


Fig. 658. Fig. 659.

Fig. 658. Closing a wound caused by the removal of the lining and the outer wall of a cyst. Removing the lining from another cyst.

Fig. 659. The wounds closed. Numerous smaller cysts have been simply punctured, as indicated by the resulting slit-like openings.

For this reason, preservation of the tube along with the ovary is advisable when the tube is in condition to be preserved. If the tube must be removed, particular care is required to avoid disturbance of the ovarian circulation. Again, the

preserved ovary must be fastened well up out of the pelvis, so that there is no dragging or interference with the circulation and no chance to become incarcerated in the culdesac or under peritoneal folds. It should be so placed that it may enlarge considerably without being subjected to compression that might cause pain.

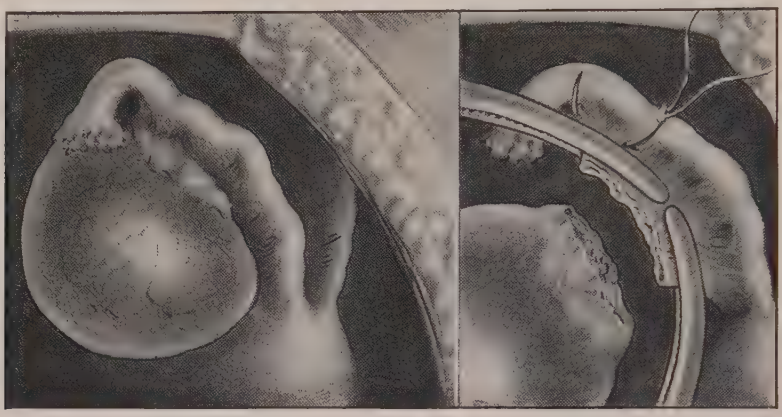


Fig. 660. Fig. 661.

Fig. 660. A cyst involving most of the ovary.

Fig. 661. The cyst and ovarian remnant excised, preserving the tube. This preservation of the tube may be advisable in a case where the other tube is excised and the ovary preserved.

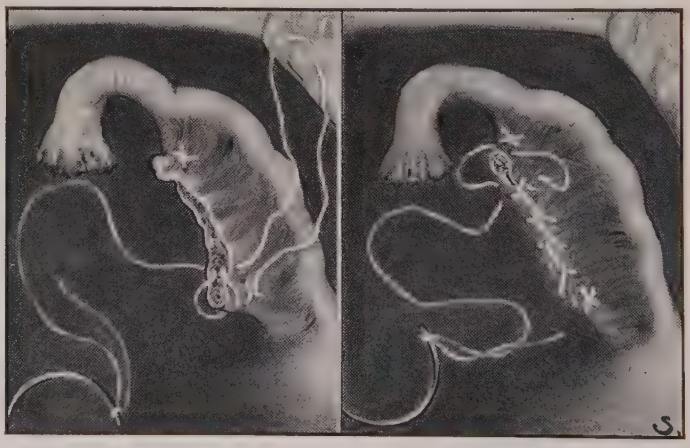


Fig. 662. Fig. 663.

Figs. 662 and 663. Ligating the pedicles and turning in all raw edges.

To be sure, a piece of ovary completely excised and reimplanted, as explained later under transplantation, may survive and functionate, but the chances of its doing so are much less than if it is preserved with unbroken circulation.

Excision of cystic area of ovary. In some cases of cystic ovary, the cysts are so grouped that they may be excised en masse, leaving a large part of the ovary

comparatively healthy. Fig. 652 represents such a condition, the cysts being distributed in a central longitudinal zone. This zone may be excised as indicated in Fig. 655, leaving a considerable amount of ovarian tissue at each side. The sides of the large raw area left are approximated and oozing checked by one or two rows of sutures (Figs. 654 and 655).

Puncture of cysts. When the cysts are distributed throughout the ovary, as shown in Fig. 656, excision is impossible if any considerable amount of ovarian tissue is to be preserved. If such an ovary is to be saved, two courses are open.

a. The ovary may be fastened up well and then let alone, depending on the cysts remaining stationary and not causing much trouble.

b. The cysts may be punctured, evacuated (Fig. 657), and the wall and lining of the larger ones removed (Figs. 657 and 658). The bleeding is then checked and the wounds closed by sutures (Figs. 658 and 659). In some cases

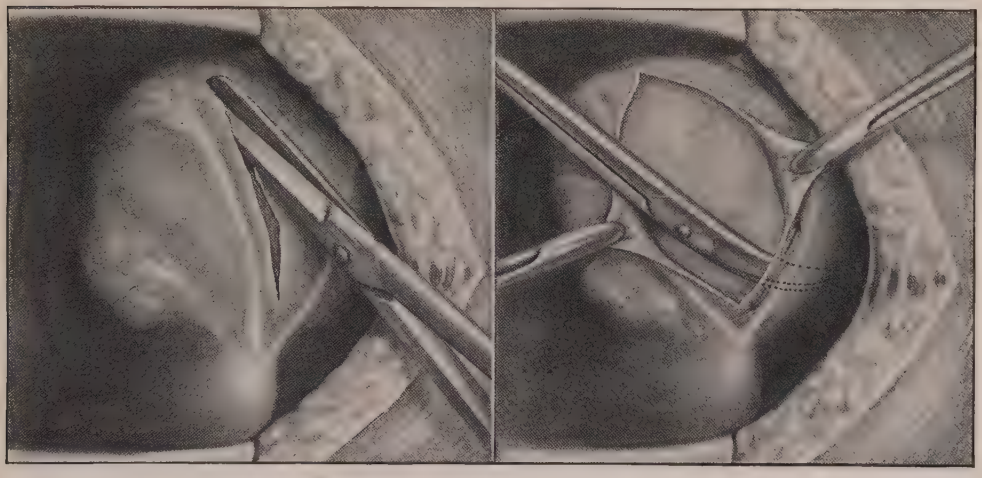


Fig. 664. Fig. 665.

Fig. 664. Conservative operation for a small broad-ligament cyst. The peritoneum of the broad ligament is divided in the area between the tube and the round ligament.

Fig. 665. Enucleating the cyst with curved blunt scissors.

an ovary so treated gives no further trouble. In other cases the treatment seems to stir up more cystic activity than was before present, so that the ovary becomes several times its former size and must be removed by a second operation, after some months or a year or two.

Excision of ovary and tumor, leaving tube. When the ovary is so far involved that it must be sacrificed, it may be advisable to save the tube. This preserves a chance of pregnancy if the other ovary is preserved, even though the other tube must be removed.

The tumor and ovarian remnant are removed (see Figs. 660 and 661). The pedicle is then ligated and the edges turned in (Figs. 661, 662 and 663). This should be accomplished in a way that will not interfere markedly with the mo-

bility of the tube. For to increase the chance of pregnancy, the fimbriated end of the preserved tube should be fastened near the ovary of the opposite side.

Broad-ligament disease. There are two affections of the broad ligament which permit of conservative operative treatment—abscess and tumor.

Broad-ligament abscess. Vaginal drainage is usually the preferable treatment in these cases. Even when the mass must be attacked from above, the drainage may usually be provided in a way that will permit of preservation of the tube and ovary if those structures are not involved.

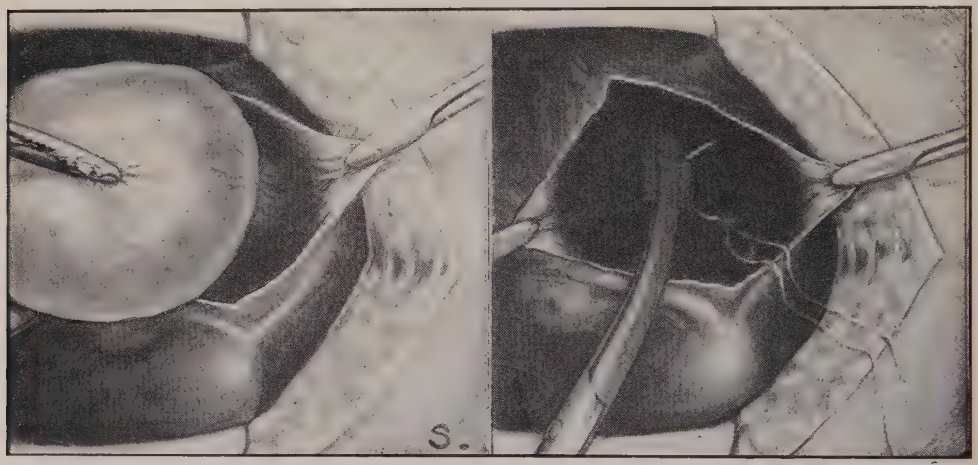


Fig. 666. Fig. 667.

Fig. 666. The cyst lifted out of its bed.
Fig. 667. Ligating the vascular pedicle under the cyst.

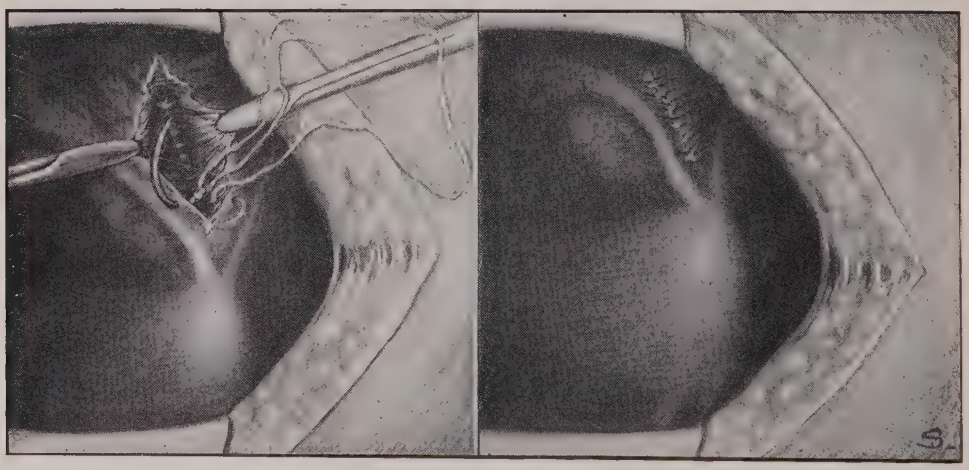


Fig. 668. Fig. 669.

Fig. 668. Closing the cavity by buried and superficial sutures.
Fig. 669. The operation completed, leaving the tube and ovary intact.

Parovarian tumor. A small parovarian cyst, which has not yet damaged the tube and ovary by stretching and pressure, may be removed, leaving the adnexa intact. The peritoneum over the cyst is split between the round ligament and the tube, as shown in Fig. 664. The tumor is then shelled out by blunt dissection, as indicated in Figs. 665 and 666. The bleeding points are caught and ligated (Fig. 667) and the cavity is obliterated by bringing its sides together by buried sutures (Fig. 668). The peritoneum is then closed over, as shown in Figs. 668 and 669.

Tubal disease. There are three affections of the Fallopian tubes that permit of conservative operative treatment.

Tubal inflammation. An occluded tube with the end distended, as indicated in Fig. 670, but without persistent active inflammation, is the usual lesion calling for conservative treatment. The most satisfactory conservative method of dealing with such an occluded tube is to simply split open the distended end

Fig. 670. Fig. 671. Fig. 672.

Fig. 670. The occluded distended tube. The line of incision is indicated by the broken line.

Fig. 671. The incision has been made, a portion of the lax tube wall has been trimmed away and the edges are being sutured.

Fig. 672. The salpingostomy completed, leaving the ovary in contact with the opening to facilitate the passage of ova into the tube. A slender probe is to be passed gently through the tube into the uterine cavity to overcome occlusion in the interstitial portion.

by a long incision and sew it open by suturing the mucosa to the peritoneal coat, as indicated in Figs. 670, 671, and 672. Before the suturing, enough of the tube wall should be excised to maintain the opening.

If the outer portion of the tube is so seriously affected as to necessitate its removal, the canal of the smaller portion of the tube may be sewed open. After the diseased portion has been removed and the pedicle ligated, as shown in Figs. 673, 674, and 675, the opened end of the tubal stump is enlarged by splitting with sharp-pointed scissors along the line indicated in Figs. 675 and 676. The mucosa and peritoneum are then sutured together as shown in Figs. 677, 678, and 679. This gives an open tube without raw edges. To increase the chance of pregnancy, the ovary should be fastened near the open end of the

tube. The canal of the inner portion of the tube is so small, especially when narrowed by inflammation, that it is difficult and sometimes impossible to satisfactorily open it. Hence the salpingostomy should always be made in the wider portion of the tube when conditions will permit.

Conservation of the damaged tube is contraindicated when it is affected by tuberculosis or malignant disease or purulent inflammation or gonorrhœal inflam-

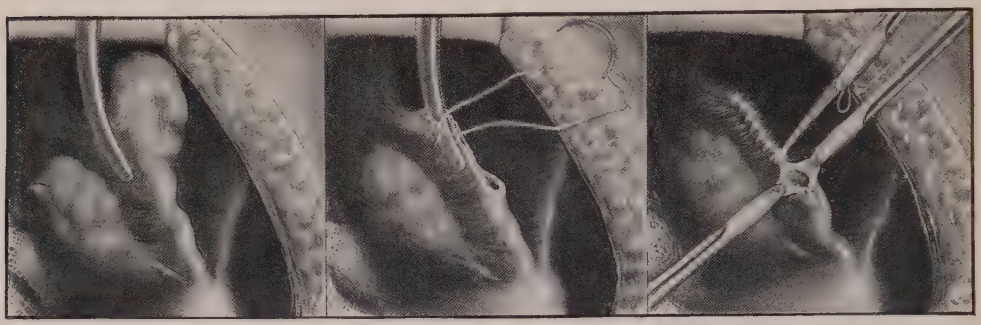


Fig. 673. Fig. 674. Fig. 675.

Figs. 673, 674 and 675. Resection of a closed tube.

Fig. 673. The vascular pedicle of the diseased portion of the tube has been clamped.

Fig. 674. The diseased portion of tube has been excised and the ligature for the vascular pedicle is in place ready to be tied.

Fig. 675. The pedicle of the excised portion has been ligated and sutured, and the suture has been left long for traction. The end of the stump of the tube is to be split, as indicated by the dotted lines.

Fig. 676. Fig. 677. Fig. 678. Fig. 679.

Fig. 676. The stump of the tube has been split and is ready for the suturing of the mucosa to the peritoneal coat.

Figs. 677, 678 and 679. Suturing the mucosa of the split tube to the peritoneal coat. This checks oozing and tends to make a permanent opening. For this suturing, fine plain catgut or silk or linen may be used. It is well to fasten the open end of the tube near the ovary.

mation even without pus. Experience has shown that salpingostomy, in chronic gonorrhœal salpingitis, does no good and may do much harm. In such cases the affected tube should be excised into the uterus.

It is apparent, then, that conservative operation on the tubes has only a very narrow field, being limited to tubal pregnancy and nongonorrhœal inflammation eventuating in occlusion of the fimbriated end of the tube, with or without

hematosalpinx or hydrosalpinx. Even in these cases, the salpingostomy does not remove all the difficulties. The uterine portion of the tube is occluded and may not open in spite of the assistance afforded by the salpingostomy and its tubal drainage. To overcome this interstitial obstruction, a long slender probe may be passed along the tube into the uterine cavity. When such probing is employed it should of course be carried out gently so as to avoid injury to the tubal mucosa.

The above mentioned facts make it clear that salpingostomy is effective principally in tubes which are occluded from outside causes, such as pressure from a tumor or an inflammatory mass or adhesions. The adhesions may be due to salpingitis on the other side or to colitis or to other extra-tubal inflammation. In serious inflammation of the tube itself, the narrow interstitial portion is almost certain to be irreparably occluded.

Tubal pregnancy. In a pregnancy located in the outer half of the tube, the inner half may, in certain cases, be saved if advisable. To permit it, the pregnancy must be in an early stage, before marked extra-tubal changes have taken place. To warrant it, the patient must be in fair general condition and there must be some special reason for preserving this part of a damaged tube.

Tubal tumor. In a nonmalignant tumor of the tube, the same points apply as in tubal pregnancy, though of course extreme care must be exercised to make certain that the growth is really nonmalignant.

Continuation of Menstruation.

To continue menstruation, there must be a uterus and an ovary or some functionating ovarian tissue. When it has been necessary to remove both tubes, thus removing the hope of pregnancy, it may still be possible to continue menstruation. When this is advisable, it may be accomplished by preserving the uterus and the ovaries or one ovary or even a functionating part of an ovary. The ordinary methods of preserving part of an ovary when a portion must be sacrificed have already been described (Figs. 648 to 659). In this connection it is well to recall the conservative operations on the uterus (Figs. 442 to 454), which aid in maintaining menstruation.

Continuation of Trophic Influence of Ovary.

The important trophic influence of the ovary may be preserved, even though the tubes and uterus must be sacrificed. A whole ovary should be preserved if possible, but a portion of an ovary, even a small portion preserved with good blood supply, may continue the trophic influence. Transplantation of ovarian tissue, also, may be employed to continue the ovarian trophic influence, but its efficacy is much less than when the ovarian tissue is preserved with its original vascular connections. Autotransplantation during an operation in which both ovaries are removed, is a practicable and established operation and is advisable in young women. The details are explained later.

Transplantation of Ovarian Tissue.

In certain cases in which the ovaries have been completely removed it is advisable to attempt to continue the ovarian influence, or reinstate the same, by transplantation of ovarian tissue. The implanted ovarian tissue may be from the same individual (autotransplantation), or from another individual of the human species (homotransplantation) or from a different species such as an ape or other lower animal (heterotransplantation).

Autotransplantation. This is accomplished by slicing off from the removed ovaries some healthy portion, the larger the better, and implanting the same in a prepared bed in a vascular area. When both ovaries have been removed along with a chronic inflammatory lesion, or a new growth, or in the execution of a hysterectomy, rendered difficult by adhesions or tumor nodules, there may be a healthy area of ovary suitable for transplantation. Such transplantation is especially indicated in patients of a nervous type who are still menstruating at the time of operation. Experience has shown that these ovarian grafts "take" surprisingly well when proper provision is made for a good blood supply. Their period of functional activity, however, is usually limited to a few months or a year or two. Both clinical experience and animal experimentation have demonstrated that ovarian tissue which has been once severed from its vascular connection sooner or later undergoes degeneration and atrophy and replacement by connective tissue. Consequently, when there is ovarian tissue to be preserved, it should if possible be preserved with its original vascular connection. Immediate survival is then certain and prolonged functional survival is possible and probable.

In certain cases, however, the fact that there is any ovarian tissue suitable for preservation, can be determined only after the mass involving the ovary has been removed and spread out for minute critical examination. In such a case transplantation is of benefit to the patient even though the ovarian tissue eventually disappears by atrophy. During the period of some months or a year or more in which the remnant functionates, the troublesome menopause symptoms are diminished. The menopause comes on gradually. As one writer has well expressed it, the patient is "let down easy." The control of the menopause symptoms is much more certain and decided than when dependence is placed entirely on the internal administration of ovarian or lutein tissue.

Technique. There are certain principles or rules that should be kept in mind when making such transplantation of ovarian tissue. In the first place, a good blood supply is necessary to a satisfactory result. This is provided by placing the graft in vascular tissue. In the second place, provision should be made for a possible cystic enlargement of the ovarian remnant. Cystic enlargement is very common in ovarian grafts and the disturbance resulting from it depends a good deal on the location of the preserved ovarian remnant. If the graft is situated in firm tissue or is surrounded by dense adhesions or is caught under a displaced uterus or by the pelvic brim, any decided enlargement is likely

to be accompanied by troublesome symptoms. On the other hand, if the graft is free to expand with no other pressure-effect than gradual stretching of the peritoneum, the disturbance resulting from such enlargement is reduced to a minimum.

A very satisfactory location is in the broad ligament close to the top of the uterus. At the site of implantation, the peritoneum is divided and pushed aside. This should be done carefully so that bleeding will not be started in the vascular tissue surrounding the uterus. If bleeding starts and ligatures are necessary to control it, the peritoneal separation should be extended so as to permit implantation of the graft away from the ligatures. The graft should, if possible, be excised from the damaged ovary in such a way as to leave a considerable portion covered by peritoneum. The raw surface of the graft is placed against the raw surface prepared for it and is held in place by suturing the peritoneum around the edge with very fine catgut. When so placed the graft is in immediate contact with a markedly vascular area, and also has plenty of room for expansion should cystic enlargement develop.

Another satisfactory site for implantation is the wedge-shaped area left in the uterine wall by the deep excision of the tube. The rectus muscle also has been selected as the site of implantation in some cases. The ovary should be placed on the under surface of the muscle so that it may expand inward without much resistance. As later mentioned, transplantation has been made, also, into the thigh and into the breast. The continuation of the function of the ovary does not depend upon its location but upon satisfactory blood supply.

The tissue to be transplanted should, of course, be fastened in its new situation as promptly as possible after its vascular connection is severed. If there is considerable work to be executed before the implantation can be made, the graft should be preserved in saline solution at blood temperature or, better still, allowed to rest in contact with the body fluids in the peritoneal cavity.

Homotransplantation and Heterotransplantation. The transplantation of an ovary or part of an ovary from one person to another has been carried out a number of times with apparent success. But later observations have not sustained the primary enthusiastic hopes. It is doubtful whether any ovarian tissue thus transplanted has continued to functionate. Heterotransplantation, using certain types of apes, has been still more disappointing. Martin, who has made a study of this subject for years and has written much concerning it, brings the matter up to date in a recent excellent article (Surgery, Gynecology and Obstetrics, November, 1922). In his conclusion the evidence is summarized as follows:

"1. Clinically, there is very little to encourage one to believe that transplantation of ovaries as practiced up to the present time has more than speculative value as a surgical procedure.

"2. There is some evidence that autotransplants are of some value in deferring the symptoms of the menopause and delaying the cessation of menstruation. It is difficult, however, not to attribute some of this evidence to suggestive therapeutics or to undetected ovarian tissue left *in situ*.

"3. There is practically no convincing evidence that homotransplants have been successful in the human female.

"4. There is no evidence that heterotransplants have been successful where the human female has been the recipient.

"5. There is some encouraging evidence recorded in experimental animal surgery that not only autotransplants but homotransplants and even heterotransplants have been successful and the sexual function of the castrated animal maintained.

"6. The technique followed by the various operators on human females, in too many instances, seems unsurgical and too often is incompletely and loosely recorded, leaving the impression that the conclusions derived from such work must be unreliable.

"7. There is, however, encouraging evidence in all of this endeavor to lead one to hope that the subject will be pursued experimentally, especially for the purpose of devising a rational and simple technique, based on the work of the serologists, the endocrinologists, the hematologists, and the practical clinical surgeons."

CHAPTER XII.

MISCELLANEOUS INTRAPELVIC AFFECTIONS.

In this chapter the operative treatment of the following diseases will be considered:

Extrauterine Pregnancy.
Pelvic Tuberculosis.
Fulminating Pelvic Edema.
Varicose Veins of Broad Ligament.
Tumor of Tube.
Echinococcus Disease.
Appendix Considerations.

EXTRAUTERINE PREGNANCY.

In extrauterine pregnancy the fertilized ovum has located and is developing outside the uterine cavity. In all but very exceptional cases, it is situated primarily at some part of the Fallopian tube. Consequently the term "tubal pregnancy" is almost synonymous with "extrauterine pregnancy." Occasionally, however, the location is in the ovary or between the ovary and the tube.

In pointing out the operative treatment for extrauterine pregnancy, several clinical classes must be considered—namely (1) before rupture, (2) hematocele, (3) repeated moderate intraperitoneal hemorrhage, (4) profuse intraperitoneal hemorrhage, (5) hematoma, and (6) advanced cases.

1. Before Rupture. The only safe plan of treatment in this stage is abdominal section and removal of the pregnant tube as soon as the diagnosis is fairly certain. The patient is in constant danger of a sudden serious hemorrhage, hence the sooner she is operated on the better. If the tube is lying low in the culdesac, it might be reached and ligated from below (vaginal section), but this is not an entirely safe undertaking. The manipulations may serve to start a sudden severe hemorrhage which could not be promptly checked from below, particularly as these pregnant tubes are frequently bound in place by old adhesions. The safe operation in this stage is removal of the pregnant tube by abdominal section.

2. Pelvic Hematocele. In these cases the hemorrhage has long since ceased and the collection of blood low in the culdesac is well shut off from the general peritoneal cavity by plastic exudate and adhesions. The embryo and membranes have probably escaped from the tube, either through a rupture in the wall or through the end of the tube by "tubal abortion," and perhaps have been largely absorbed. Practically all that remains is the blood in the pelvis,

with the exudate and adhesions around it. This forms a tender mass low in the culdesac back of the uterus, without much disturbance higher.

In such a case it is well to watch the patient for a while, in the meantime keeping her quiet in bed. In the course of a week or ten days there will be decided improvement, showing that Nature is taking care of the blood and exudate and that the patient will probably recover without operation, or there will be renewed evidences of irritation, showing that the embryo and membranes are still growing or that the blood and exudate are acting as a persistent source of irritation. When there is persistent irritation after this period of rest, operation is indicated.

The choice of operation depends on the circumstances of the case. If the evidences of irritation (pain and tenderness) are all low in the culdesac, the probability is that evacuation of the blood from the culdesac by vaginal section will be all that is necessary. If the pain and tenderness extend into the upper part of the pelvis, abdominal section is the safer operation. When the conditions are doubtful the abdominal route should be chosen.

In a case where a hematocele is to be evacuated by vaginal section, the patient should be prepared for an abdominal section also, for there is a possibility of the vaginal manipulations starting an internal hemorrhage which could not be satisfactorily controlled from below.

3. Repeated Moderate Intraperitoneal Hemorrhage. This class comprises the majority of the cases of tubal pregnancy. There are repeated attacks of pelvic pain accompanied with marked abdominal tenderness and confinement in bed from one to several days. There is a gradually increasing adnexal mass, composed of blood and exudate, presenting marked tenderness on examination. The pulse may or may not show blood-loss, depending upon the extent of the immediately preceding hemorrhage. Such cases are frequently mistaken for ordinary salpingitis with exudate, and are treated accordingly for weeks before the true nature of the trouble is suspected. The differential diagnosis does not come within the scope of this work, which deals exclusively with operative treatment. The etiology, pathology, symptoms and diagnosis are considered in detail by the author in his textbook (Diseases of Women).

The treatment for such a case is abdominal section as soon as the diagnosis is clear and the patient can be taken to a hospital and given the regular careful preparation for that operation. The technique is in general the same as for salpingitis with exudate. If the ovary is badly damaged, it is removed along with the damaged tube (Figs. 632 to 634). If the ovary is not much damaged, it may be preserved (Figs. 640 and 641). There is no occasion to excise the stump of the tube into the uterus unless the stump is markedly thickened from old inflammation. An important point is prevention of excessive hemorrhage as the mass is broken from its attachments. The conditions are such that the least disturbance of the mass starts bleeding, consequently the work of enucleating the mass and clamping the outer and inner vessels of the damaged tube should be accomplished rapidly.

4. Profuse Intraperitoneal Hemorrhage. In these cases immediate abdominal section is advisable, as a rule, if the patient is within reach of an experienced abdominal surgeon and can be gotten into suitable surroundings. In the absence of an experienced operator and suitable facilities, operation had better be deferred.

In operations for the various classes of cases of extrauterine pregnancy, as well as other conditions in which abdominal section is required, the patient's chance of recovery is greater if the operation can be conducted in a well-ordered hospital. Consequently, the patient should be taken to a hospital if possible. Even a trip on the train, with the patient on a stretcher and in a strictly recumbent posture all the time, is less hazardous than operation in poor surroundings. The marked emphasis which teachers and writers generally have placed upon promptness of operation in extrauterine pregnancy has unfortunately led to considerable indiscriminate operating in these cases—operations on patients in which it would have been safer to wait a while, operations without adequate antiseptic preparation, operations by persons without sufficient surgical experience to handle the serious intra-abdominal conditions in a safe and effective way. Even in the restricted class of cases in which there is free intraperitoneal hemorrhage, the so-called "tragic" cases, it is probable that not many patients really die at once from the loss of blood. There are some who do but they are comparatively few, as indicated by mortuary records, and by the number of patients who come to operation later with a history of having passed through a severe attack of intraperitoneal hemorrhage. It is the repeated hemorrhage, with the resulting peritoneal irritation and inflammation coming on within a few days or a few weeks, that constitute the greatest menace and that causes death, rather than the mere withdrawal of a certain amount of blood from the circulation at the primary rupture. This being the case, the patient has a better chance of surviving the primary loss of blood if simply kept quiet without operation, than if operated on at an inopportune time or without reliable antiseptic preparation or by a person without adequate experience in abdominal surgery.

In most of these cases the hemorrhage has ceased by the time the physician reaches the patient. Whether or not this is the case can be determined with a fair degree of certainty, as a rule, by watching the patient for a short time. If the hemorrhage has ceased, it will be seen that the pain is diminishing and the pulse getting better. If it is decided to defer operation until the patient has recovered from the shock and the acute anemia, the patient must be kept quiet in the horizontal posture absolutely and should make no voluntary movement—no sitting up, or moving of the extremities, or straining, no enemata, or purgatives. If she is to be moved to a hospital, it must be with practically no more disturbance than if she were lying flat in bed. For the first forty-eight hours avoid bowel movement if possible and give very little food. The severe thirst caused by the blood loss, may be relieved by small doses of water, and by saline solution per rectum by the drop method (proctoclysis). Pain and restlessness are to be re-

lieved by sedatives hypodermically or by mouth. Guard against vomiting and avoid pelvic examination, for either is very likely to start up fresh hemorrhage. After the first two or three days a little more freedom may be allowed as regards nourishment, enemata, and movement of arms and legs. But the patient must maintain the horizontal posture strictly. The patient must be especially warned against straining in any way and against trying to sit up a little because she feels better. An attempt at sitting up in bed may undo all the good of the previous rest. Where the hemorrhage has been very severe it will usually require ten days to two weeks for the patient to recuperate sufficiently to present a good margin of reserve force for the operative work. With a less abundant internal hemorrhage the patient may be in good condition for operation within a few days.

It must not be forgotten that in these cases there is always the possibility of the hemorrhage starting up again suddenly, in spite of the care to prevent it. Consequently, the patient should, if possible, be in the hospital while waiting for her "deferred operation." Then, if renewed hemorrhage develops, operation can be carried out promptly before the patient again passes into the condition of extreme collapse. These desperate cases, where the vital forces are at a low ebb, require much judgment and discrimination as to when to operate in a particular case and as to just what to do at the operation—on the one hand, to stop the bleeding and thus prevent the patient from passing into an absolutely hopeless condition, and, on the other hand, to avoid snuffing out the little spark of life remaining, by the added strain of intraperitoneal manipulations and anesthesia. The anesthesia and operative work must be reduced to a minimum, both in duration and extent. Some cases can be satisfactorily operated on under local anesthesia, and occasionally there is a case in which the patient's sensibilities are so obtunded that practically no anesthesia is necessary for the work required.

5. Pelvic Hematoma. In the case of a pelvic hematoma, if there are any evidences of active or recurring hemorrhage, the preferable treatment is abdominal section with removal of the damaged tube and the blood-mass in the broad ligament. If there is simply a quiescent blood-collection in the connective tissue, keep the patient quiet and watch. If the blood-mass is gradually absorbed, keep the patient quiet till the mass has largely disappeared and then she may be allowed up and be counted practically well. If the mass remains stationary and symptoms of pronounced irritation persist or arise later, the patient should be subjected to operation, abdominal or vaginal as indicated by the location of the mass and the accompanying symptoms.

6. Advanced cases. These cases vary so much that it is impossible to give a rule applicable to all.

In some of them immediate operation is indicated. In other cases, it is advisable to wait for a time, either because the child has only recently died and the placenta and adhesions are still dangerously vascular, or, in rare cases, be-

cause there is good reason to hope for saving the child alive without unjustifiable risk to the mother.

PELVIC TUBERCULOSIS.

Pelvic tuberculosis nearly always begins as tuberculosis of a Fallopian tube. Occasionally tuberculosis in some other part of the abdominal cavity will extend along the peritoneum to the pelvis, giving rise to pelvic peritoneal tuberculosis.

In tuberculous salpingitis, the tuberculous process may, at the time of operation, be limited to the pelvis (tubes and peritoneum) or it may have extended to the general abdominal cavity. A very large proportion of the cases of general abdominal tuberculosis are due to the extension from tuberculosis of the tubes.

The operative treatment of pelvic tuberculosis consists in removal of the affected tubes, as far as practicable, and of other structures that may harbor the disease or facilitate its progress. Next to cancer, tuberculosis is the most serious disease that affects the pelvic structures. Consequently, the most radical measures are justified when necessary to cure or limit the process. As it is seldom possible to completely eradicate the disease by excision, the ultimate result depends upon the patient's local and general resistance. The operative treatment has therefore, a twofold object: (a) to remove affected tissue and (b) to increase local and general resistance. Every measure employed—removal of the tubes, removal of the ovaries, removal of the uterus—is directed toward one or the other of these effects. At the same time care must be exercised to avoid serious lowering of the general resistance by a too exhausting operation or of the local resistance by injury of the intestine or bladder. Intestinal coils are often involved in the tuberculous process, and fecal fistula from breaking down of the involved wall is not infrequent.

There are different classes of cases, mainly representing different stages of progress, and the operative treatment varies somewhat with the form of lesion present. In this respect the cases may be grouped into three classes, as follows: (a) Marked adnexal tuberculosis without extensive adjacent involvement, (b) universal tuberculosis of pelvis and lower abdomen, and (c) slight tuberculosis of tubes.

Marked adnexal tuberculosis without extensive adjacent involvement. The tubes should of course be removed. It is advisable to remove the ovaries also, and the uterus, unless there is some special and strong reason for limiting the scope of the operation. The ovaries are usually already involved, but even if not clearly involved, their removal is advisable to prevent the recurring menstrual congestion, which increases the pelvic irritation and favors spread of the disease.

The uterus should, as a rule, be removed, because experience has shown that in tubal tuberculosis the uterine portion of the tube is likely to be involved along

with the other portion and in many cases the endometrium also is affected. Therefore, to leave the uterus is to court defeat.

Drainage is not advisable, and contamination of the abdominal incision, or of other cut surfaces, with tuberculous material should be most carefully avoided.

Universal tuberculosis of pelvis and lower abdomen. Here practically all the structures of the pelvis and lower abdomen are involved in the tuberculous process. The tubes, ovaries, uterus, bladder, intestines and omentum are matted together in a conglomerate mass. In many cases the structures are so densely adherent and so infiltrated and disorganized that differentiation is difficult. In attempting to separate the organs, in order to remove the tubal focus, the degenerated wall of the intestine or bladder may be torn or perforated. Consequently, in the operative treatment of such cases, great care must be exercised to avoid injury of the intestine or bladder, which would tend to make the condition worse. Again, the bleeding and traumatism of extensive operation may so shock the patient as to cause her death or to seriously lower her general resistance. The plan in these very extensive cases is to remove the focus when practicable, with the minimum amount of traumatism. The separation of adhesions should be carried no further than necessary for removal of the tubal focus. And in some cases, even this is not advisable on account of the probability of breaking into the intestine or bladder. A fecal fistula may result also from subsequent tuberculous ulceration through the involved intestinal wall.

In quite a number of severe cases decided improvement has followed simple opening and closing of the abdomen, and, in the exceptionally severe cases above mentioned, it is better to trust to this and the nonoperative measures that may later be employed, than risk probable injury of the intestine or bladder by the extensive separation of dense adhesions.

In cases of abscess from mixed infection, with high fever and evidently serious trouble from the abscess itself, the abscess may be drained, either by way of the vagina or by way of the abdomen. Drainage by either route is not generally satisfactory, as the walls of the drainage opening are likely to become tuberculous and discharge indefinitely. But some drainage tracts heal and, at any rate, the drainage relieves the acute and threatening symptoms.

Slight tuberculosis of tubes. There may be exceptional cases in which the involvement is slight and special circumstances warrant preservation of the uterus and ovaries. However, such cases must be extremely rare, for the risk of continued spread of the disease during the periods of menstrual congestion and irritation is great.

Again, there are cases in which the involvement is so slight or atypical as to make the diagnosis doubtful. There is an unusual form of chronic peritoneal inflammation with scattered thickened spots which so closely resembles tuberculosis that it has been called "pseudo-tuberculosis." When there is a question as to the diagnosis, it may be advisable to remove only the palpable involved tissues.

FULMINATING PELVIC EDEMA.

Fulminating pelvic edema is the term applied to an intense and widespread edema of the pelvic interior, that comes on suddenly without apparent adequate cause. It is accompanied with serious symptoms and usually with extreme prostration. In fact, the sudden onset and the severity of the symptoms and the marked collapse, suggest ruptured tubal pregnancy, and this mistaken diagnosis has been made in some of the cases. It is a rare condition and presents a puzzling problem in etiology and in diagnosis. Most of the cases have been associated with chronic inflammatory lesions in the pelvis, but why the sudden edema and serious symptoms should develop without apparent cause has not been satisfactorily explained. Clinically, however, the condition must be recognized and treated, hence its inclusion here. The salient features of this rare affection together with treatment can best be presented by detailing some typical cases.

Case 1. The author was called in consultation by Dr. S. T. Bassett, of St. Louis, to see a patient with pelvic disturbance. It was Sunday; the patient had attended church in the morning feeling fairly well but while there became very sick and could scarcely get home. She had a chill, followed by severe headache and general aching, but no localizing symptoms. There was no apparent local trouble in any part of the body to account for the fever, which rose to 105.5°. By evening there was evidence that the pelvis was the seat of the disturbance and the author was asked to see the patient.

Examination. The patient was seen about 10 P. M. The temperature had been reduced to 104°. The pulse was rapid, but of fair volume. The pelvis was filled with a tender mass which surrounded the uterus and fixed it firmly. There seemed to be acute pelvic inflammation with extensive exudate. But there was no apparent cause, either recent or remote. The patient had always been rather nervous and this had been somewhat worse of late, but there had been no symptoms indicating pelvic disease of any kind. The next day the temperature was 104.2°, pulse 120, respiration 28, and there was much peritoneal irritation. Operation at once was indicated, to check the rapidly progressing inflammation, if possible, and accordingly the patient was taken to the hospital.

Operation. When the abdomen was opened the pelvis was found filled with small encysted collections of fluid involving the tubes, ovaries, broad ligament and uterus. The cysts or pseudocysts were of various sizes, were filled with clear serum and seemed to extend deeply into the substance of the organs involved. From the appearance, hydatid disease was suspected. All the cysts that it was feasible to remove were removed and then the pelvis was drained through the abdominal incision.

The temperature dropped within a few hours to 98°, and it did not again go high. During the first part of the period of convalescence it ranged from 99° to 100.2°, and later dropped to normal, where it remained. The wound and drainage tract healed rapidly and the patient had a smooth convalescence. Laboratory

examination of the tissues removed showed no bacteria of any kind, no evidence of hydatid disease, and no specific pathologic process that would adequately account for the alarming symptoms and the marked tissue change.

Case 2. Reported by Briggs. A married woman, whose menstruation had been normal, came complaining of malaria and some pelvic pain. Pelvic examination showed nothing abnormal except a slight fullness about the left adnexa. Two days later the patient returned to the office, very sick. Her face was pale and pinched and anxious; pulse 120, small and weak; temperature 100°. The pelvis was then completely filled with a fluctuating mass. The rapid development of the mass, with almost no fever, pointed to hemorrhage as the cause, and a diagnosis of tubal pregnancy was made. At the operation the pelvis was found filled with small cysts of various sizes, formed by collections of serum within the connective tissue. There was no tubal pregnancy. The pelvis was drained and the patient recovered.

Case 3. Reported by Briggs. Patient's menstruation was delayed four days, then came on scanty and was accompanied by paroxysmal pains which caused the patient to think she was having a miscarriage. After some days the pain became more severe and the patient had two fainting spells. Temperature was normal, pulse 90, small, and compressible. The abdomen was sensitive. Sedatives were given, which diminished the pain, but the shock increased. The radial pulse became imperceptible and the skin and mucous membranes were markedly anemic. The uterus was enlarged, retroverted, fixed and sensitive, adnexa not felt. Liquid could be demonstrated in the flanks. Diagnosis, tubal pregnancy with rupture.

Operation. The pelvis and lower abdomen were filled with great blebs, due to the collection of serum in the connective tissue, causing the peritoneum to pouch into the pelvis from all directions. Both tubes were chronically inflamed and the right ovary was enlarged and cystic.

The patient's condition continued bad and she died some hours after the operation. The feature of the case was the enormous amount of serum pocketed in the connective tissue, without any evidence of recent inflammation.

Case 4. Reported by Legueu. Shortly after a normal menstruation, patient was suddenly attacked with violent pelvic pain accompanied by syncope, extreme pallor and cold extremities. The abdomen was distended, hard and painful to pressure. Vaginal examination disclosed a fluctuating mass in the culdesac. Diagnosis, retrouterine hematocele. On opening the abdomen a quantity of yellow serum escaped. There were large collections of serum in the tissues about the right adnexa, aggregating a pint. The patient recovered. Examination of the serum showed only leucocytes and peritoneal cells.

Case 5. Reported by Jocet. Patient, aged 28, married eight years, no children, had, on three separate occasions, an attack of severe abdominal pain accompanied by an accumulation of fluid in the right iliac fossa, which presented the characteristics of hematocele. Twice the mass terminated by resolution and the

patient was perfectly well in the intervals. The third time, after the usual symptoms of the supposed hematocele had continued some weeks with improvement, the patient was suddenly seized with violent abdominal pain, accompanied by pallor, anxious facies and incessant vomiting. The mass enlarged and there developed features that pointed to inflammation rather than hemorrhage as the cause of the trouble. Operation showed the pelvis filled with encysted collections of serum, and finally, deep in the pelvis, there was found an old ovarian abscess, which was evidently the exciting cause of the surrounding edema.

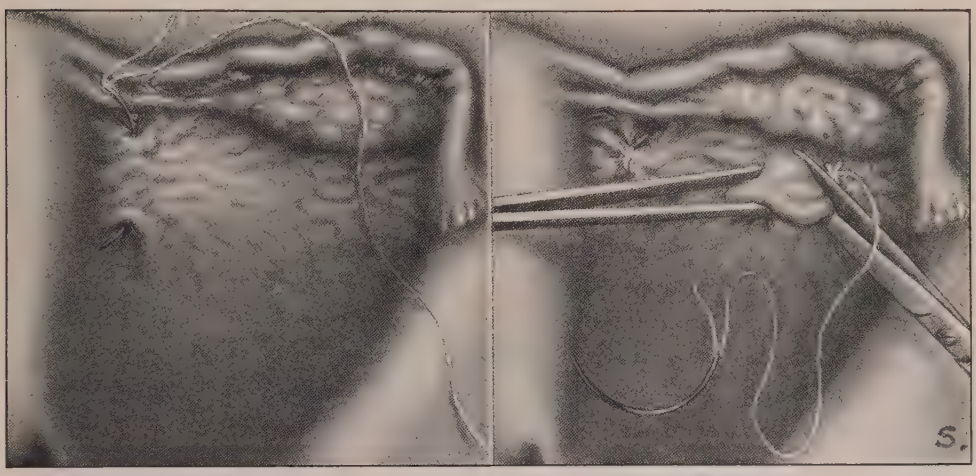


Fig. 680. Fig. 681.

Fig. 680. Excision of Varicose Veins of the Broad Ligament. The mass of varicose veins is shown and also the location of the ligature close to the uterus.

Fig. 681. The inner and outer ligatures are in place, and the affected veins have been picked up preparatory to excision.

VARICOSE VEINS OF BROAD LIGAMENT.

The recognition and treatment of varicose veins of the broad ligament has reduced still further the class of patients presenting troublesome symptoms without discoverable cause.

The preferable treatment is excision of the bulk of the affected veins. If the varicocele is associated with salpingitis or oöphoritis, the veins are removed along with the adnexa. If the adnexa do not require removal, the mass of veins is ligated at each end with chromic catgut or fine silk, as indicated in Figs. 680 and 681. The ligated veins are then excised (Figs. 681 and 682). Oozing is checked and the raw area closed by suturing, as shown in Figs. 682 and 683. Then the pedicles are turned in and all raw edges covered by a second row of sutures. In Fig. 683 the needle is in place for beginning this second row of sutures, which buries the first row. When the suturing is finished, the suture is tied to the long end at the right.

Another method is to ligate the mass of veins in three or four places and then cut across the veins between the ligatures. This is not as complete or satisfactory an operation as the one above described but is useful for cases where the complete excision is not practicable.

Simple ligation of the veins is the least satisfactory method of dealing with them and should not be depended upon except when there are complicating conditions that forbid further work.

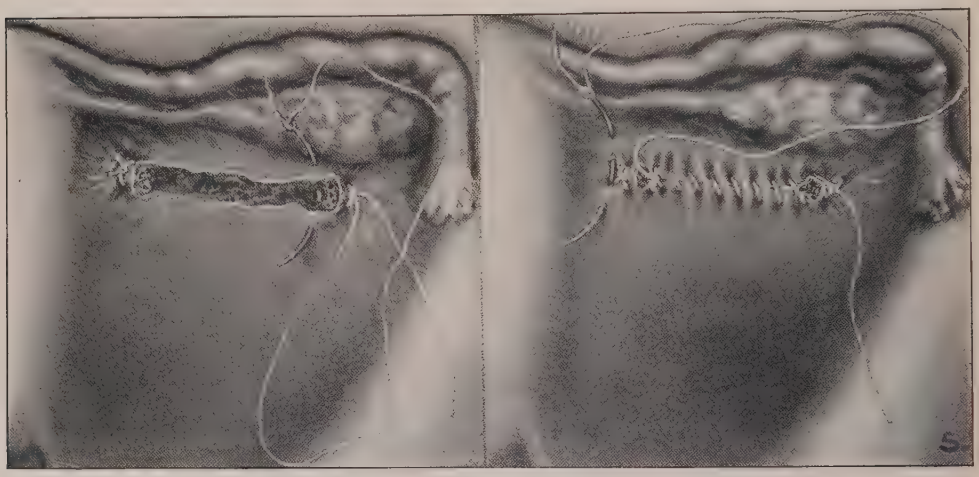


Fig. 682. Fig. 683.

Fig. 682. The veins occluded by the ligatures have been excised and the needle is in place for beginning the closure of the wound.

Fig. 683. The wound has been closed and the needle is in place for beginning the second suture-row which will close over all raw surfaces.

TUMORS OF TUBE.

There are rare conditions, such as tumor of the tube or echinococcus disease of pelvis, the operative treatment of which needs no special description. Each condition is to be dealt with on the general principles applicable to the particular form of disease present.

In nonmalignant tumor, the tumor is to be removed with the minimum disturbance of surrounding structures. Adenomyoma is the most frequent form of nonmalignant tumor of the tube, and usually occurs along with adenomyomata in the uterus and other adjacent tissues.

If the tumor is malignant and still operable, it is to be removed along with all adjacent tissues likely to be involved.

In **echinococcus disease** of the pelvis, all the cysts should be completely removed if possible. If complete removal is impracticable, the cysts that are left should be broken and the contents and lining removed.

APPENDIX CONSIDERATIONS.

The gynecologist must frequently deal with the vermiform appendix. It lies close to the right adnexa and often in contact. Differential diagnosis between appendiceal and adnexal lesions is difficult in certain cases, and not infrequently both structures are affected. Even when the appendix is not diseased, its removal while the abdomen is open is indicated in a large proportion of patients operated on for pelvic lesions. Consequently the technique of a safe and satisfactory method of removal is here described and illustrated—see Figs. 684 to 704, with accompanying descriptions.

The question as to whether or not the appendix should be removed as a routine procedure in abdominal operations for pelvic disease, has been much

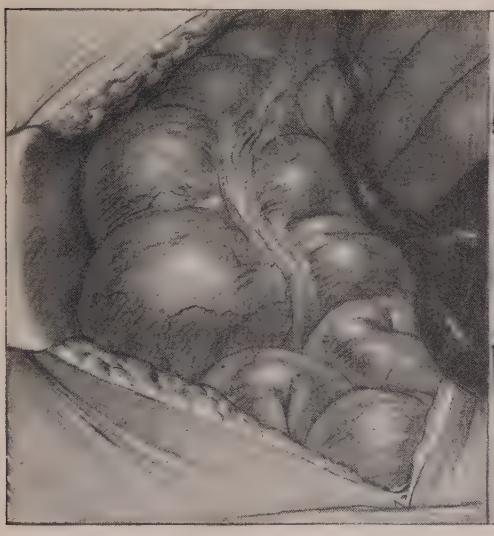


Fig. 684.

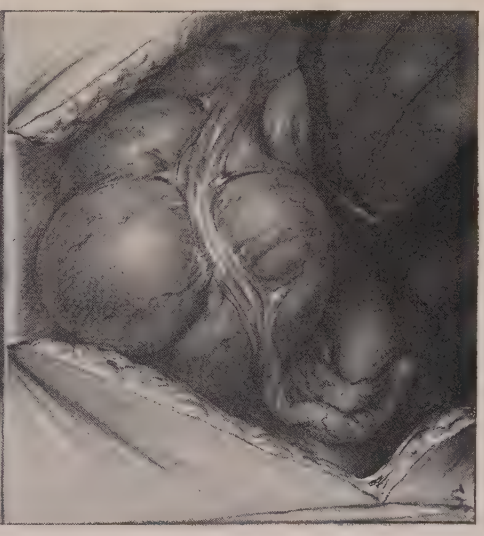


Fig. 685.

Fig. 684. Locating the Appendix. The patient is lowered from the Trendelenburg posture to the horizontal, the right side of the incision is pulled far outward and the coils of small intestine occupying the right iliac fossa are carried to the left. These maneuvers expose the cæcum as here shown. Notice the longitudinal band which leads to the base of the appendix. Black rubber sheeting is used over the intestinal coils, as explained in Chapter XV.

Fig. 685. Locating the Appendix. The longitudinal band on the anterior surface of the cæcum is followed downward, leading one directly to the base of the appendix. The remaining coils of small intestine are then caught and carried to the left, exposing the appendix as here shown.

discussed. The fact that the normal appendix may cause trouble later if left and that its removal may be accomplished during the pelvic operation with but little additional risk, has led some authorities to insist on its removal in all cases. On the other hand we must not forget that, though the risk is slight, there is nevertheless a very definite risk assumed whenever the ap-

pendix is excised, for its removal necessitates opening the intestinal tract in the peritoneal cavity. With due care and proper technique there is seldom trouble, but exceptionally, there is leakage with serious results. In deciding whether or not to remove the appendix, the risk of removal must be considered along with risk of future trouble from the appendix in that particular case. In some cases the appendix is markedly retrocaecal, cannot be caught in the reparative exudate, and would require much disturbance of tissue and considerable additional risk to extricate and remove. In such a case, leaving a normal appendix is probably less risky than the disturbance of removing it. Again, in a poor operative risk or a very extensive operation, where the strain on the vital organs leaves only a small margin of safety, it is important to avoid any additional risk even the slight one of removing the normal appendix.

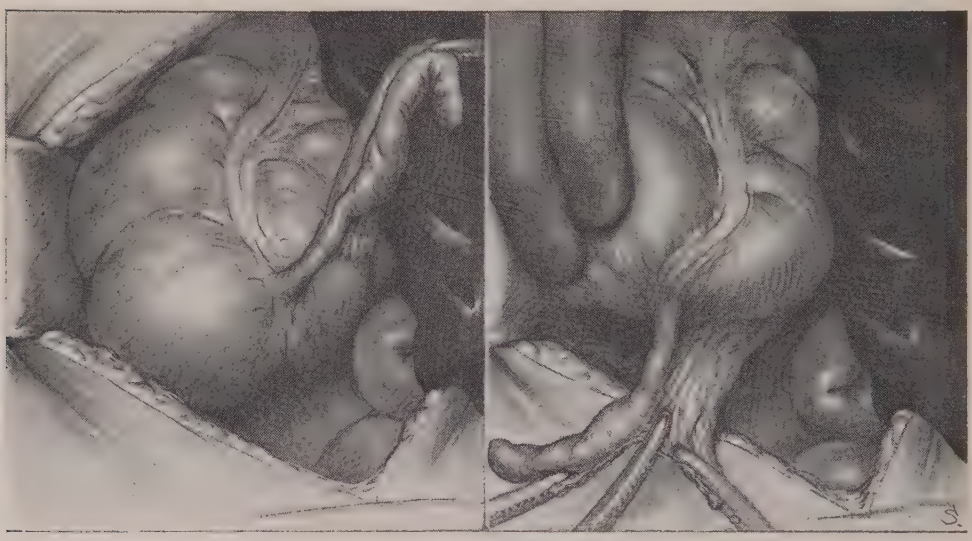


Fig. 686. Fig. 687.

Fig. 686. The appendix is lifted by catching an adjacent part of the mesoappendix, care being taken to avoid compression of the appendix which might cause rupture and leakage. As the appendix is first lifted it is usually not in a convenient position for excision. The author has found that it can nearly always be brought into a convenient position for excision by the assistant placing two fingers on the outer portion of the cæcum and lifting the same as shown in Fig. 687.

Fig. 687. The simple maneuver above described has been executed, bringing the appendix into a convenient position for clamping and dividing the mesoappendix.

In such a case it is safer to take the chance of future appendix trouble and operation, than to put any additional strain on the vital organs at this critical time. For several years the author has been guided by the following working rules in deciding in individual cases whether or not to remove the appendix. (See p. 474.)

Fig. 688.

Fig. 689.

Fig. 688. The mesoappendix has been clamped and divided in steps, and clamp No. 1 has been placed on the appendix to crush the area where the appendix will be divided. For this purpose a strong toothed forceps is advisable.

Fig. 689. Clamp No. 2 applied. This clamp will remain in place to prevent leakage when the appendix is excised.

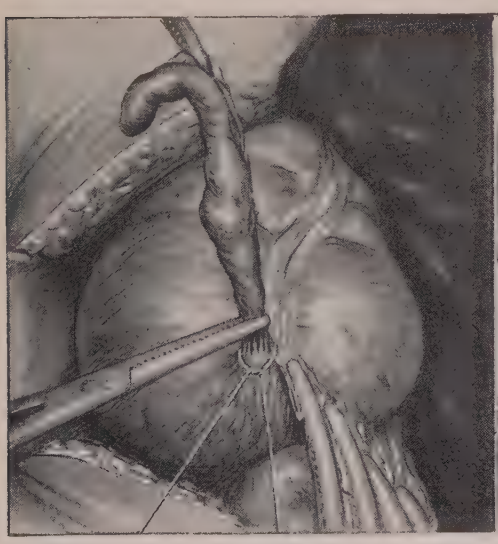


Fig. 690.

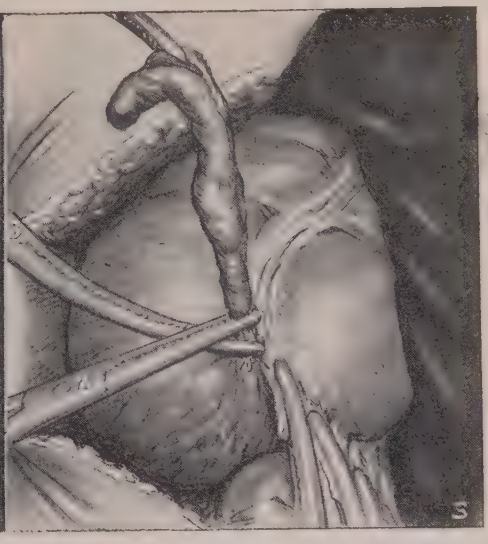


Fig. 691.

Fig. 690. Clamp No. 1 has been removed, showing the crushed area. A plain catgut ligature is being placed just proximal to the crushed area.

Fig. 691. The ligature has been completed and the area caught with a smooth tipped forceps, preparatory to division of the appendix through the crushed area between the two forceps.

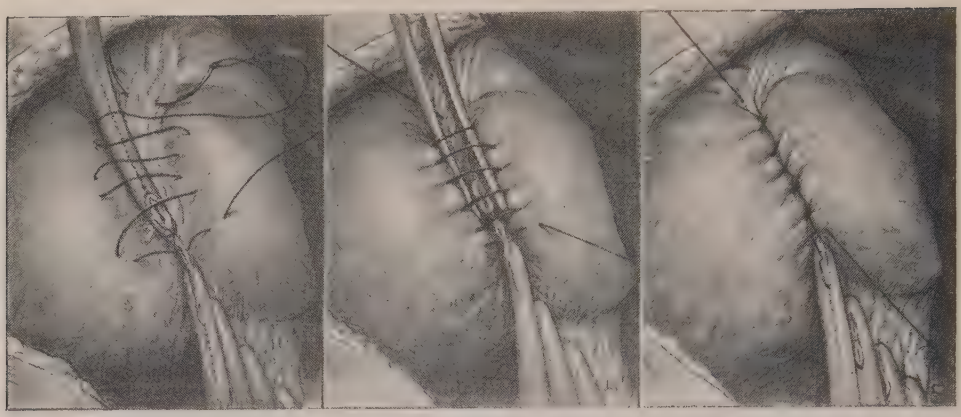


Fig. 692. Fig. 693. Fig. 694.

Fig. 692. The appendix has been excised and the stump, held in the forceps, sterilized by carbolic acid followed by alcohol. The back-and-forth inverting suture here shown, devised by Bartlett, is very convenient and satisfactory. To insure good inversion, be careful that the first loop includes a bite through the mesoappendix, as here indicated. This inverted suture should be of silk or linen so as to maintain secure closure.

Fig. 693. The inverting suture has been completed and the forceps has been opened preparatory to its removal.

Fig. 694. The inverting suture drawn taut, giving good inversion. The ligature about the appendix stump (Fig. 690) *should be of fine plain catgut,* so that it will be absorbed quickly and allow the inverted area to communicate with the caecal cavity. Another point of importance is to excise the appendix *flush with the caecal wall.* This favors prompt opening of the stump into the caecum, and also prevents the stump-trouble that sometimes occurs when a small portion of the appendix is left. Again, the inverting suture should be applied as closely as practical about the forceps, so as to include no more area than necessary to give good inversion.

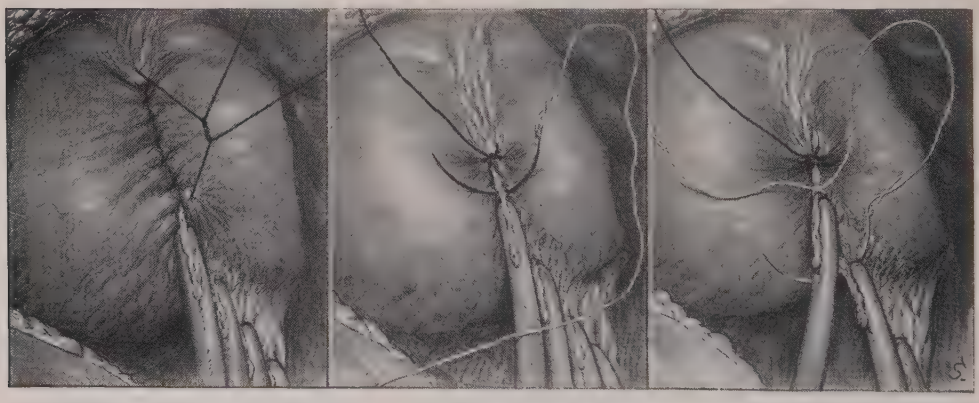


Fig. 695. Fig. 696. Fig. 697.

Fig. 695. Tying the inverting suture, giving a second inversion of tissue—practically the same as by two purse-string sutures.

Fig. 696. Double inversion completed. The needle-arm of the silk suture is cut away, but the other arm is left long so that it may be tied later to the mesoappendix ligature. Beginning the ligation of the mesoappendix.

Fig. 697. Insuring hemostasis by systematic suture-ligation of the mesoappendix. A continuous suture-ligature is used and the needle is passed each time at the tip of the next forceps, so that no tissue can escape ligation.

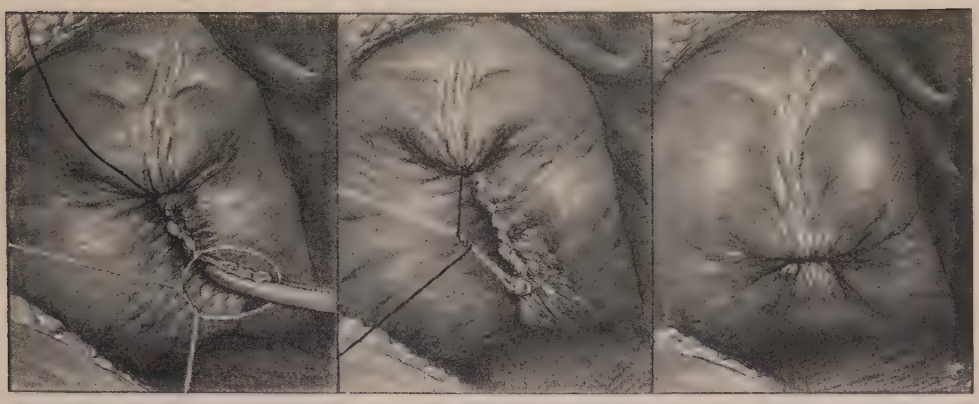


Fig. 698. Fig. 699. Fig. 700.

Fig. 698. Completing the suture-ligation of the mesoappendix. After the completion of ligation of the mesoappendix, a careful inspection should be made to see that there is no bleeding from a small portion which has slipped out of the ligature. This slipping of a small portion out of the grasp of the ligature is likely to occur, especially in the fat mesoappendix.

Fig. 699. Tying the mesoappendix suture and the appendix suture together, to cover the raw pedicle-ends and further reinforce the inverted area.

Fig. 700. The operation completed.

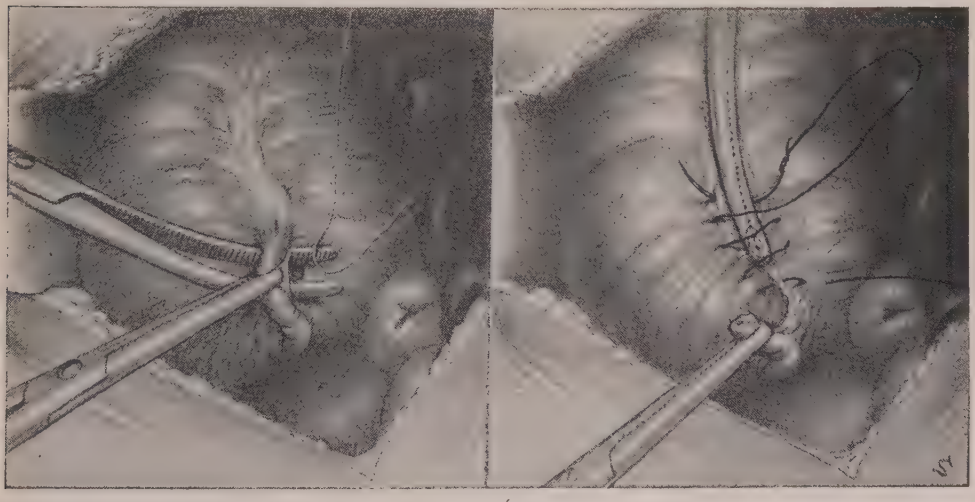


Fig. 701. Fig. 702.

Fig. 701. Removing the appendix when it lies so far retrocaecal that the tip cannot be brought up for excision in the regular way. In such a case the removal is facilitated by first dividing the appendix at its base as here shown, and then using traction on the appendix to bring up the mesoappendix for systematic clamping and division. The division of the appendix and inversion of the stump are carried out the same way as in the regular technique, except that both divided ends of the appendix are sterilized as soon as divided. In the illustration, the base of the appendix has been crushed and clamp No. 2 applied distal to the crushed area, and a catgut ligature, for ligating the base of the appendix, is ready to be drawn into place.

Fig. 702. Appendix divided and the inverting suture in place.

A. Remove the appendix for any one of the following four reasons:

1. If it is evidently diseased.
2. If there is a history of pain or other disturbance that may be due to it.
3. If it is in the operative field, and hence likely to be caught in the reparative exudate.
4. If the patient requests its removal.

B. Do not disturb the normal appendix ordinarily under the following circumstances:

1. If it is so markedly retrocaecal as to require extensive tissue separation to extricate and remove it.
2. If the patient is such a poor operative risk or the operation is so extensive that the vital organs are taxed close to the safety limit.

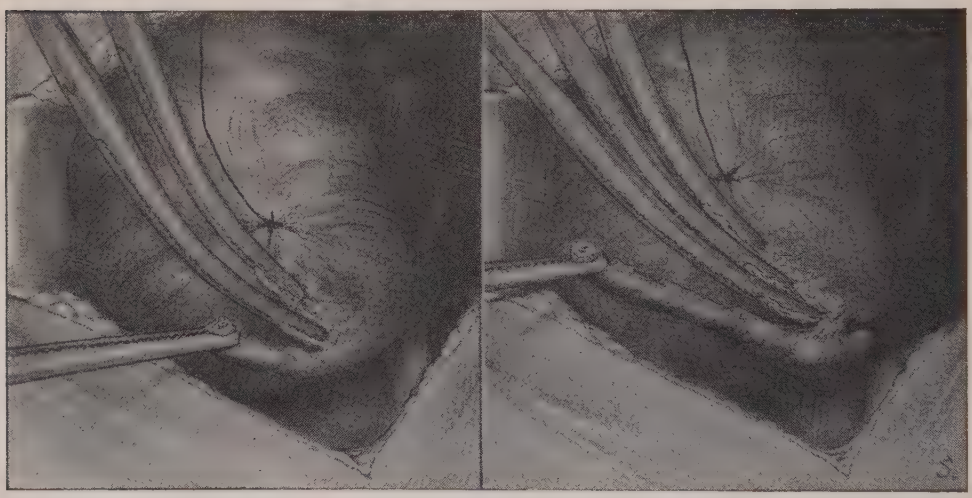


Fig. 703. Fig. 704.

Fig. 703. Inverting suture completed. Clamping and division of the mesoappendix begun.

Fig. 704. Clamping and division of the mesoappendix almost completed. The ligation of the mesoappendix is carried out as in the regular technique.

Action under these rules is based on a definite reason for removing the appendix or for leaving it, as the case may be. If trouble follows its removal, there will still be no regrets, for the removal was based upon a definite reason and not simply upon the fact that the "abdomen was open" or that the appendix was "easily removed." If when the appendix is preserved, later trouble occurs leading to operation, there is no occasion for regrets, for the additional safety thus secured at the critical time is well worth the risk of future operation at a less critical time.

CHAPTER XIII.

EXTERNAL GENITALS AND VAGINA.

Operative treatment is required for a number of conditions affecting the external genitals and the vagina. These conditions will be considered in the following order:

Malignant Disease of External Genitals.
Malignant Disease of Urethra.
Malignant Disease of Vagina.
Nonmalignant Tumors.
Stasis Hypertrophy.
Kraurosis Vulvæ.
Affections of Vulvo-vaginal Glands.
Imperforate Hymen.
Stenosis of Vaginal Opening.
Atresia of Vagina.
Absence of Vagina.
Urethrocele.
Inflammation of Skene's Glands.
Destruction of Urethra.
Incontinence of Urine.

MALIGNANT DISEASE OF EXTERNAL GENITALS.

The operative treatment of malignant disease of the vulva, whether affecting the labia or clitoris, consists in the removal of the whole external genitals, together with the regional lymphatics as far as practicable. The structures mentioned, along with the connecting lymphatic vessels, should be removed *en bloc* if possible.

Lymphatics of the vulva. The lymphatics of the external genitals have been well worked out by investigators, and quotation is made from Sappey, from Poirer and from Cunéo and Marcille. "The lymphatics of the vulva arise from a network the extremely close meshes of which are superposed in several planes. This network covers the fourchette, the meatus urinarius, the vestibule, the clitoris, the labia minora and the internal surface of the labia majora; it is so loose and close throughout that when it has been well injected, it presents at first sight merely an ashy-grey appearance. To distinguish the innumerable silvery filaments of which it is composed, we must use a magnifying glass. On the external surface of the labia majora, the network, composed of smaller and larger branches, becomes sufficiently distinct to be recognized by the naked eye.

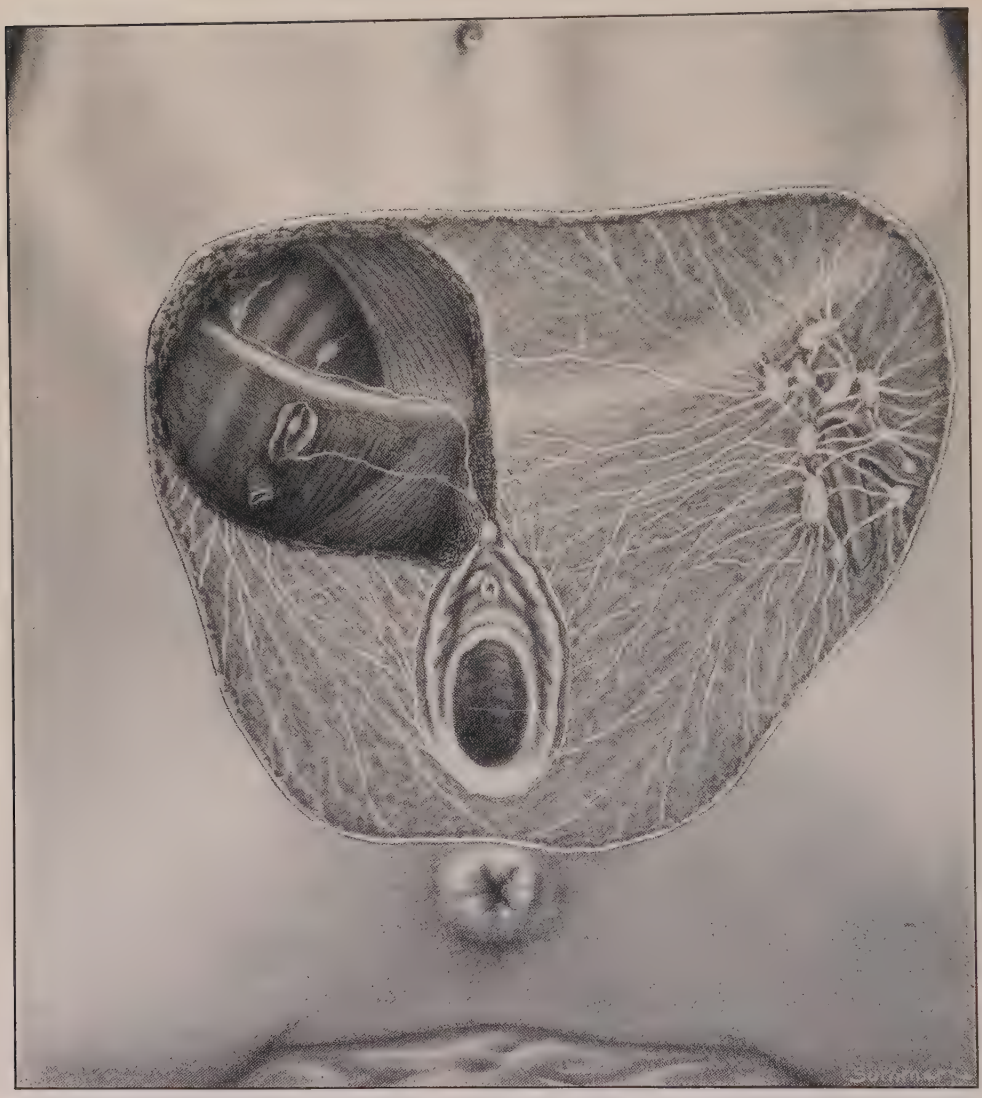


Fig. 705. The Lymphatics of the External Genitals. The lymphatics of the labia and the hymen and the floor of the vestibule pass upward and outward to the inguinal glands, as explained in the text.

The lymphatics of the prepuce of the clitoris follow the same course. Lymphatics from the glans of the clitoris, however, pass deeply to the base of the clitoris. From there, one vessel passes across the inner muscles of the thigh to the femoral canal and then through the canal to the interior of the pelvis, encountering a small gland on the way. Another vessel runs up over the pubic joint and then along in the inguinal canal, eventually reaching the glands in the interior of the pelvis.

"From the periphery of this network of origin run the collecting trunks. The direction of these trunks varies according to their points of origin. Those which come from the anterior third of the vulva, run directly upward and forward

towards the mons veneris. There they turn sharply and run transversely towards the superficial inguinal glands. The trunks which come from the posterior two-thirds are directed upward and outward, and directly reach their terminal glands (see Fig. 705).

"The majority of the lymphatics of the vulva terminate in the glands of the supero-internal group. It is even possible, though more rare, to see some of these vessels reach a gland belonging to one of the two external groups. As has been seen, the vulvar lymphatics are far from being confined to a perfectly definite glandular group.

"When injecting one-half of the vulva, the mass may frequently be seen to

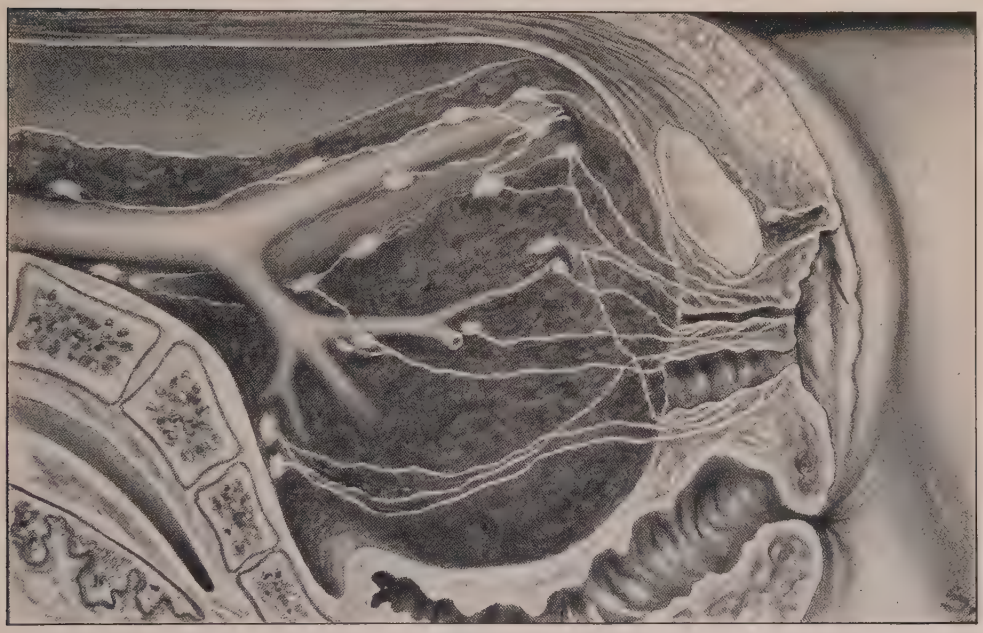


Fig. 706. The Lymphatics of the Urethra and the Anterior Portion of the Vagina. From both structures the lymphatic vessels pass backward directly to glands in the interior of the pelvis. Consequently cancer of the urethra or vagina soon becomes inoperable because of dissemination to inaccessible pelvic glands.

reach the glands of the opposite side. The injection of these glands may take place by a double process. Sometimes it is effected on account of the continuity of the network of origin of the two sides of the vulva in the middle line; in others it is due to the fact that some of the collecting trunks cross the middle line, and end in the inguinal region of the opposite side. In all cases when dealing with an epithelioma of the vulva, the inguinal glands of both sides should be regarded as liable to infection.

"The lymphatics of the *clitoris* deserve special mention. In fact, though the lymphatics of the prepuce of the clitoris pass into the superficial inguinal glands, like the other lymphatics of the vulva, this is not the case with the lymphatics of

the glans of the clitoris. These latter, which were passed over in silence by the older writers, have recently been studied by Marcille and Cunéo. As their general arrangement is identical with that of the lymphatics of the glans in the male, we will content ourselves by indicating it briefly.

"As in the male, the network of origin gives rise to several collecting trunks which run on the dorsal surface of the clitoris, and reach the front of the symphysis; they anastomose at this spot, and form a presymphysial network in which some small glands may be seen. From this plexus run two sets of collecting trunks. (a) One of these vessels runs in the inguinal canal and ends in the external retro-crural gland. This vessel is usually placed beneath the round ligament, and may show in its course a small interrupting glandular nodule. (b) Other trunks run toward the crural canal and end in a deep inguinal gland, in the gland of Cloquet, and in the internal retro-crural gland." The gland groups receiving the lymphatics of the clitoris are indicated in Figs. 705 and 706.

The lymphatics of the *urethra* in the female have the same distribution as the lymphatics of the membraneous and prostatic portions in the male. They empty, therefore, into the middle and internal chain of the external iliac glands, into the hypogastric glands and into the glands of the promontory (Fig. 706, also Figs. 546 and 547).

From this statement of the lymphatic distribution, the following facts become apparent:

1. From a cancer of a labium majus or minus all the lymphatic distribution in the early stage is likely to be to the inguinal glands (Fig. 705).

2. This distribution may extend, not only to the side on which the lesion is located, but also to the opposite, hence the glands on both sides should be removed.

3. In cancer of the clitoris, a very early distribution to the glands inside the pelvis is probable (Figs. 705 and 706).

4. In cancer of the urethra, also, invasion of the interior of the pelvis is favored by the lymphatic distribution (Fig. 706).

Technique of Operation.

The problem is to remove all tissue likely to be involved, without cutting across any of such tissue. The same principle should be followed here as in radical operation for malignant disease elsewhere, namely, to avoid incision into involved tissue because of the danger of implantation recurrence. The block of tissue removed should include the external genitals with a wide margin of skin about the lesion, the collection of lymph vessels as they run upward and outward to the inguinal glands, and the mass of glands themselves on each side. This may be accomplished by the following steps:

1. An incision is made around the skin surface to be removed, outlining the area, as shown in Fig. 707. This should include a wide margin about the lesion and the surface covering of the external genitals on both sides and outward for a considerable distance over the lymphatic vessels of each side. Near the glands

Fig. 707. Outlines for the Block Excision of the External Genitals for Cancer.

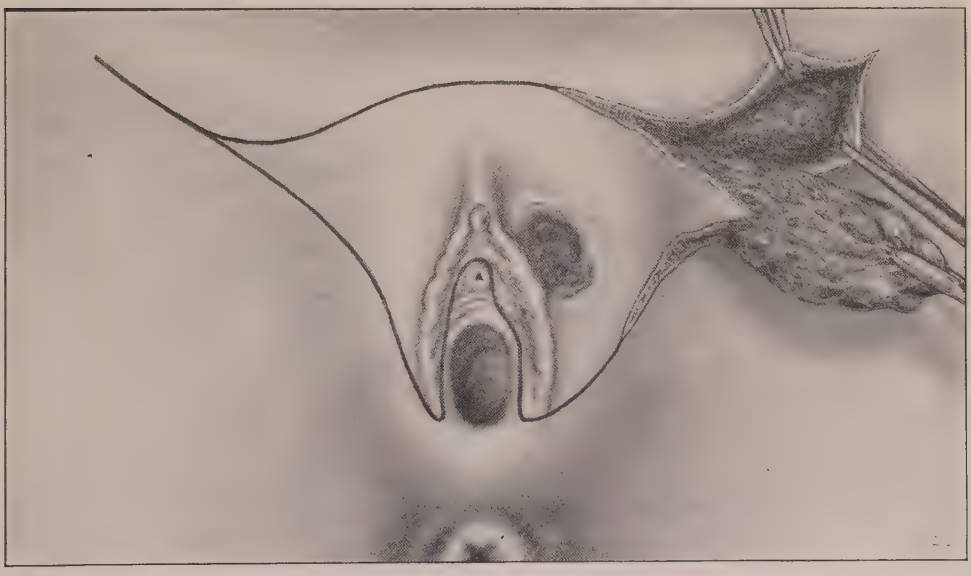


Fig. 708. The inguinal gland-bearing tissue dissected out—the first step in the block excision.

the lymphatics from the vulva run deeper and here the skin may be simply incised and reflected as indicated in Figs. 707 and 708. It is advisable to excise the superficial tissues well up over the pubes as indicated, for some of the lymphatic vessels run upward quite a distance before turning outward (Fig. 705) and an occasional one runs across this region to the opposite side.

2. The block excision is begun by dissecting out the gland mass on each side along with the immediately adjacent tissue and also the tissue containing the lymphatic vessels from the vulva, as indicated in Figs. 708 and 709. Usually involvement of the glands of the inguinal group is confined at first to those on the inner side, but not always, consequently, the whole mass of glands in the inguinal region and grouped about the saphenous opening (Fig. 707) should be removed, taking care to avoid injury to important veins underneath.

Over the gland area the incision extends only through the skin, which is then reflected to allow access to the gland-bearing tissue beneath. As the incision is extended toward the vulva, however, the incision is extended deeply through all the superficial tissues, so that as the dissection advances a clean sweep is made of all these tissues down to the muscle and fascia (Fig. 709).

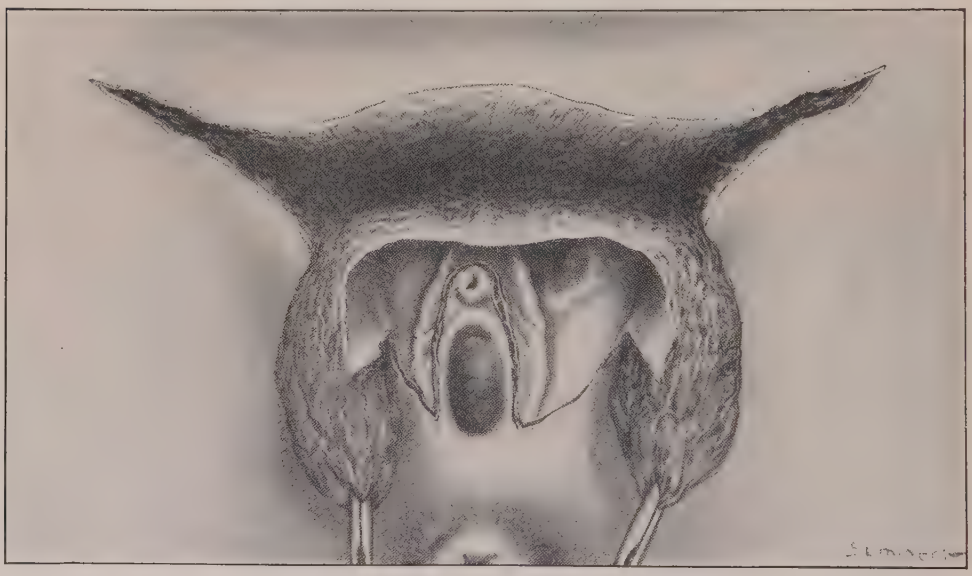


Fig. 709. The block of tissue partly excised.

3. The clear excision of the block tissue is then continued until it is completely removed, taking care to avoid injury to the urethra (Figs. 709 and 710). Only enough of the lining of the vestibule is preserved to prevent injurious contraction about the urethral opening. The lymphatics of the preserved vestibular lining run outward (Fig. 705). Consequently, if involvement by continuity of tissue can be excluded, this periurethral surface-covering may be safely preserved.

4. The large raw area left by the excision of the block of tissue is to be covered as far as practicable by the sliding of flaps, by tension sutures and by relaxing incisions. The details will necessarily vary in different cases, depending on the location and size of the lesion, which of course modifies the limits and conformation of the block excised.

The first step is to mobilize the skin and underlying superficial tissue for a considerable distance outward all the way around. Then a flap from the lower portion on each side is liberated, leaving a base for the blood supply. The flap is then carried above to help cover the large raw area there. These flaps should be carefully planned according to the conformation of the area to be covered in the particular case, as indicated in Fig. 710. Notice here that the large flap (d-e-f) is taken from the side where there is the most tissue to spare. This reduces the size of the flap to be taken from the opposite side, which is already very short of tissue. The idea is to so plan the flaps in each case and to so adjust them in their new locations, as to obviate injurious tension at any point.

When prepared, the flaps are brought together above the urethra, as indicated in Fig. 711, and sutured to each other and to the underlying tissue (Figs. 711 and 712). The various adjacent margins are then sutured together and to the underlying tissues as shown in Fig. 712.

By means of relaxing incisions when found needed, as indicated in Fig. 712, it may be possible to bring all margins together without injurious tension. If at any point the margins cannot be approximated without such tension as may cause sloughing, the margins are simply brought as near to each other as possible without serious tension and the intervening area is left to granulate. A considerable amount of scar-tissue from healing by granulation can be tolerated here without disturbance, providing it does not distort the urethra so as to interfere with its function. Consequently accurate approximation of the margins should be made about the meatus as shown in Fig. 712, leaving any areas for closure by granulation at the upper portion and well away from the urethra. This close approximation of the flaps about the meatus should be made even though it necessitates leaving such a large area above that skin grafting may be necessary. The importance of this point will be appreciated by anyone who has had to deal with extensive scar-tissue contraction in the urethral region.

Hemostasis. This is a rather bloody operation. No large vessels are encountered but innumerable small ones. The genitals usually have a very free blood supply and this is increased when a tumor is present. Though all the vessels are small, the blood loss in the aggregate may be serious, particularly in an aged or debilitated patient. Consequently all unnecessary blood loss should be prevented by having a good supply of hemostatic forceps for catching the vessels as soon as divided. If there are plenty of forceps and they are not in the way, the process of cutting and clamping may be continued until the block of tissue is removed. Then it will be found that the forceps pressure has closed the vessels at many points, and those that still show a tendency to bleed are tied rapidly with fine plain catgut. If preferred, a stop may be made at various stages of the excision to tie the vessels already clamped.

Suture material. It is advisable to use silkworm-gut sutures to maintain general approximation and fixation of the flaps, as shown in Figs. 711 and 712. Catgut is not to be depended upon to maintain the flaps in position under tension.

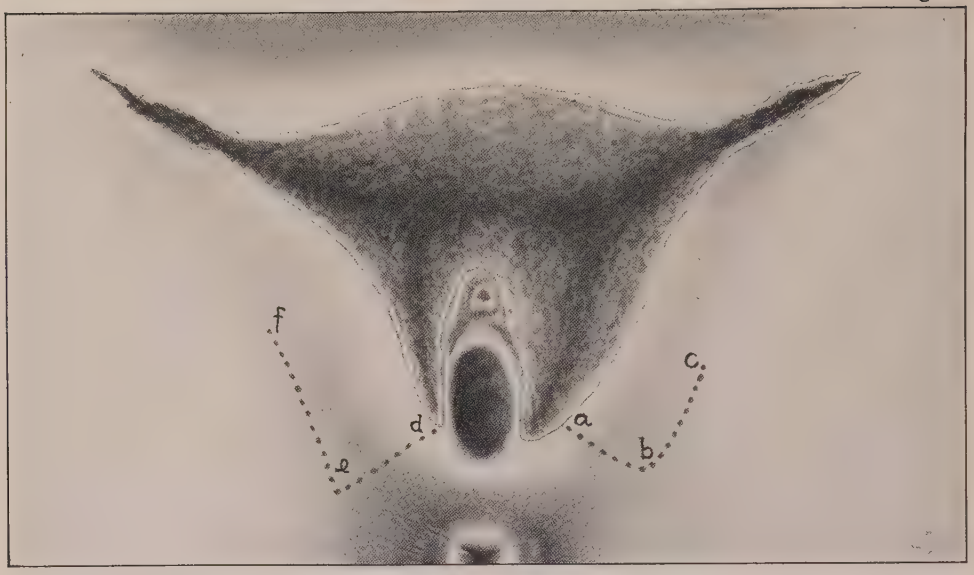


Fig. 710. The block of tissue completely excised. The skin flaps for closure of the wound are indicated by the dotted outlines.

After the incisions have been made along the dotted lines, the flaps and adjacent surfaces are to be freely separated from the tissues underneath, so that the flaps may be raised as shown in the next illustration.

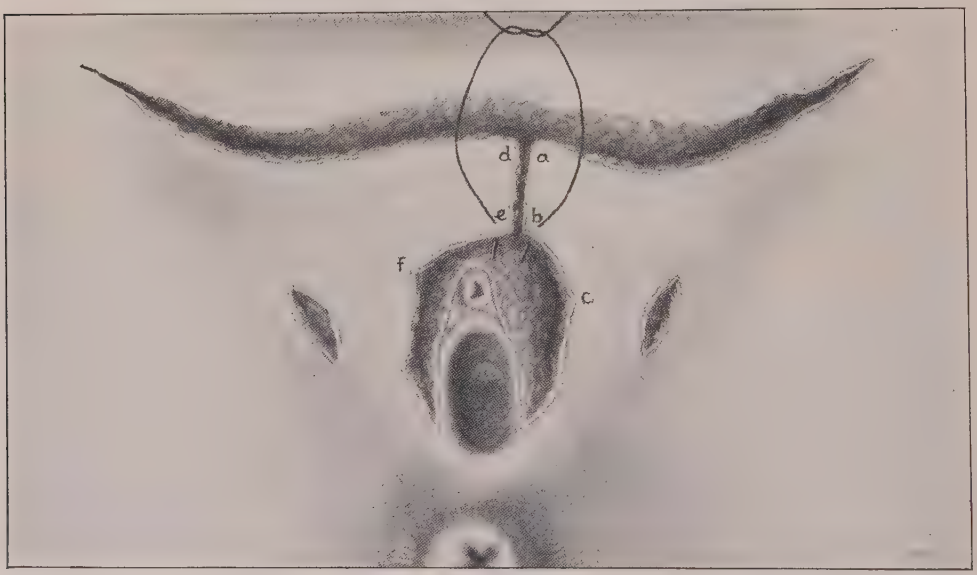


Fig. 711. The flaps *abc* and *def* have been separated from the tissues underneath and raised to the wound area above the urethra. The tension has been relieved by two relaxing incisions. A silkworm-gut suture, for fixing the lower angles of the flaps, is in place ready to be tied.

However, for superficial approximation between the silkworm-gut sutures, catgut does very well. It is conveniently put in as a running suture, as indicated in Fig. 712.

Relaxing incisions. The number, size and location of the relaxing incisions are determined as the suturing proceeds. Wherever approximation develops a line of serious tension, there a relaxing incision may be used to advantage, as indicated in Fig. 712.

Deep gland removal. Removal of the deep glands about the external iliac vessels and the beginning of the femoral vessels may be carried out by the technique developed by Bassett (Rev. de Chir., 1912) and well illustrated by Taussig in his excellent work "Diseases of the Vulva." Opening of the

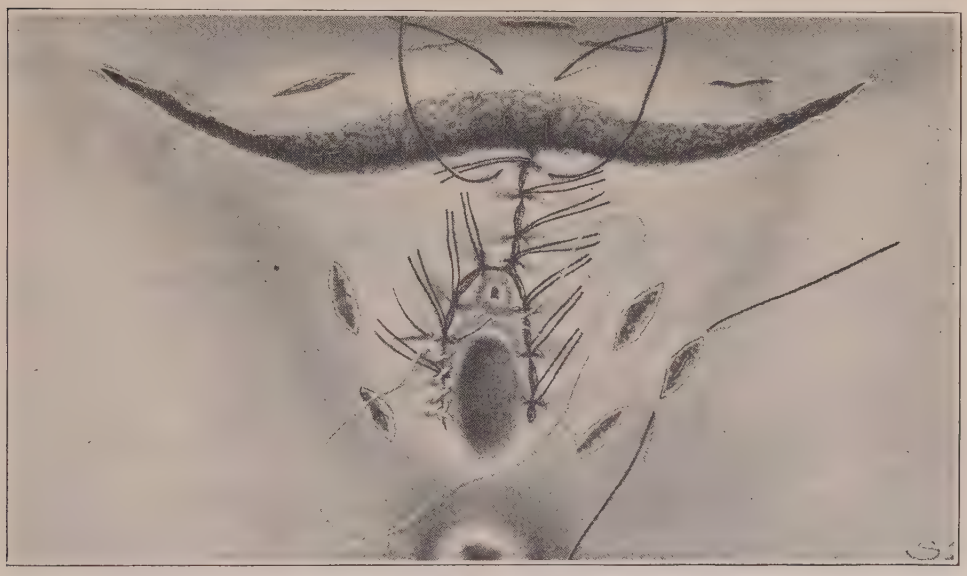


Fig. 712. The flaps have been sutured in place with black silkworm-gut sutures, with ends left long for easier removal from the swollen tissue. A superficial approximation suture of catgut is being applied. Other relaxing incisions have been made. The upper portion of the incision is to be likewise closed with tension sutures of silkworm-gut and approximation sutures of catgut.

inguinal canal and of the femoral sheath, with division of Poupart's ligament and reflection of the flaps, gives good exposure of certain of the deep glands of the pelvis.

However, the advisability of adding this extensive deep dissection to the severe operation necessitated by the thorough removal of the more superficial parts and the coincident plastic work, is very questionable. If these particular deep glands are involved, it is probable that other deep glands that cannot be removed are also involved. The patient is subjected to serious additional strain on the vital organs without compensating increase in the chance of cure. Most of these patients are well along in years and are not first-class

risks for a prolonged operation. The strain on the vital organs, the difficulties and discomforts of convalescence and the chance of disabling or painful sequelae from the operation, must all be taken into consideration in deciding how extensive to make the operative removal. It is the old question of where to stop in gland removal. In the opinion of the author it is best to limit the operation to the block-excision of the lesion and the first set of drainage glands, as shown in Figs. 708 to 713, and to depend on deep x-ray therapy to destroy cancer cells that may have reached any of the deep glands of the pelvis.

Irremovable Cancer.

When the malignant disease of the external genitals has progressed too far for radical operation, the most satisfactory therapeutic measures are roentgenization and radium treatment. Under improved methods of application, the results from these remedies have been most encouraging. It is possible that they may in the near future entirely supersede the knife in the treatment of these external growths, in both the early and later stages.

MALIGNANT DISEASE OF URETHRA.

The operative treatment of cancer of the urethra, which usually begins near the meatus, consists in excision of practically the entire urethra along with the vestibule surrounding the meatus.

The principal lymphatic drainage from the urethra is backward toward the interior of the pelvis, as indicated in Fig. 706. The lymphatic vessels empty into the middle and internal chains of the external iliac glands, into the hypogastric (internal iliac) glands and into the glands of the sacral promontory (Figs. 706 and 547). The first glandular metastases being, therefore, into the deep and inaccessible pelvic glands, these growths early become inoperable. The meatus urinarius and the adjacent covering of the vestibule have lymphatic vessels which drain into the inguinal glands (Fig. 705). If the urethral growth shows decided involvement of the floor of the vestibule, the radical operation would require also the block excision of the inguinal glands and external lymphatic vessels, the same as for a tumor of the vulva. When so advanced, however, any attempt at radical operation would be of questionable propriety, because of the almost certain previous extension into the deep pelvic glands. After excision of the urethra, it is necessary to do a plastic operation to restore control of the urine and limit scar-tissue contraction about the opening. To secure satisfactory healing at the site of the plastic work it is necessary to provide for continuous drainage of the bladder through an opening in its base.

Technique of Operation.

The radical operation, therefore, as carried out by the author in three cases of this rather rare affection, is accomplished by the following steps:

1. A temporary vesico-vaginal opening is made for continuous drainage of the bladder. This is an important expedient, which the author has used for many years with much satisfaction in all cases of extensive plastic work about the urethra. His first use of it was in one of those troublesome cases of complete destruction of the urethra by syphilitic ulceration. For several years the patient had had incontinence of urine. There was no urethra. In the center of a field of scar-tissue there was a small hole without muscular control, through which the urine constantly dripped. Repeated attempts at repair, including one attempt by the author, had resulted in failure to secure control of the urine, though the external portions of the wound healed very well. Becoming satisfied, from a critical study of the conditions in the case, that the failure to secure union of the deep tissues was due to the movements of the surrounding muscular tissues (contractions of the bladder) dependent on the presence of urine at the vesical neck and its seepage into the repaired area around the retention catheter, the author determined to try to overcome these difficulties by making continuous drainage through the base of the bladder. Accordingly, when operating on the patient the next time, an opening was made in the base of the bladder and a catheter sewed in as a preliminary step. An excellent result was secured, and the vesico-vaginal opening healed promptly and spontaneously after removal of the drainage catheter. Since then the expedient has been used with much satisfaction in all conditions requiring extensive plastic work in this region. Usually the opening closes spontaneously in one to six weeks after the tube is removed. Occasionally slight leakage persists over several months, in which case the opening may be closed by the regular operation for vesico-vaginal fistula (Figs. 310 to 312).

The size of the opening made has much to do with its prompt closure. It should be as small as consistent with satisfactory drainage. To insure satisfactory drainage a good sized catheter should be kept in the opening as long as drainage is required. It is not safe to depend simply on the opening, for in some cases it closes very rapidly, and, also, the action of surrounding muscular tissue seems to close it temporarily at times, thus interfering with free drainage.

The steps in making this preliminary drainage opening are shown in Figs. 713, 714 and 715. The location of the opening should be in the median line well back in the trigone, so as to be well away from the vesical neck and also far enough back to permit of taking short flaps for the plastic work from the anterior vaginal wall, as indicated in Fig. 717. A short incision is made through the vaginal wall and underlying bladder wall. Then the loose bladder mucosa is picked up and opened just enough to permit the passage of the catheter (size 20 F.). This opening in the loose mucosa is most conveniently made with scissors as indicated in Fig. 713. Each side of the opening is then grasped with a forceps (Fig. 714) and the catheter introduced. An ordinary catheter may be used but a retention catheter is better. In either case the catheter should be fastened in the wound by a nonabsorbable suture and it is well to close the wound snugly about the catheter by catgut sutures as indicated in Fig. 715.

2. The growth is excised and along with it the surrounding portion of the vestibule and the urethra and periurethral tissues, back to the bladder, as indicated in Figs. 716 and 717.

3. The muscular tissue in the vicinity is then piled up about the bladder opening by two or three purse-string sutures of fine chromic catgut, passed as indicated in Fig. 717. Each one is tied before the next is passed. It is well to have a very small catheter in the opening, upon which the purse-string sutures may be tied down fairly firmly. Also, the mucosa should be kept carefully drawn out beyond the ring of piled up tissue, so that it may be sutured subsequently to the transplanted flaps (Figs. 718 and 719).

4. Flaps for covering the raw surface about the urethral opening are raised from the anterior vaginal wall. The lines of incision together with the location, size and shape of the flaps, are shown by the dotted lines in Fig. 717. The rela-

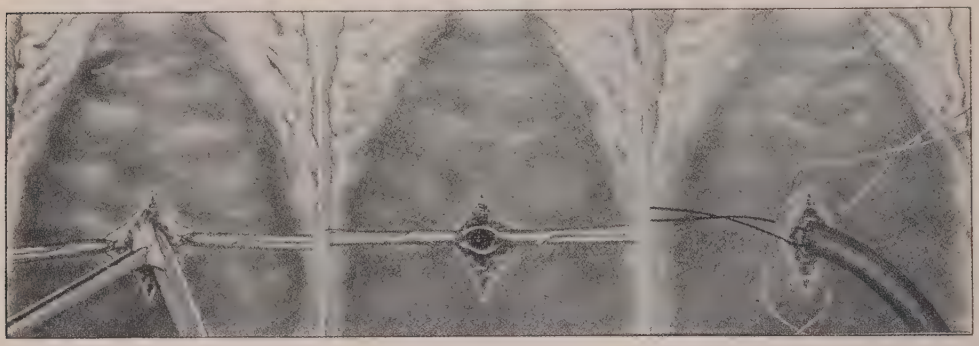


Fig. 713. Fig. 714. Fig. 715.

Figs. 713, 714 and 715. Making a Vesico-vaginal Opening for Bladder Drainage.

Fig. 713. The vaginal wall incised, and the bladder mucosa caught in forceps and being opened.

Fig. 714. The bladder mucosa divided and caught with forceps.

Fig. 715. The drainage catheter in place and the sutures ready to be tied.

tive positions of the transplanted flaps are shown in Fig. 718. The flaps are then sutured to each other and to the underlying tissues and to the stump of the urethral mucosa, as indicated in Figs. 719 to 721. As previously mentioned, an important point in plastic work in this region is to secure accurate approximation of the flaps about the urethra so as to reduce the scar-tissue there to a minimum. If it is necessary to leave an area anywhere to close by granulation, it should be left as far as possible from the urethral opening. The upper portion of the area is then closed in as far as practicable by sutures, but care should be taken to avoid injurious tension. The bladder is then washed out with boric acid solution and the small urethral catheter removed.

For suturing in this region the author prefers fine catgut, well chromicised (40-day.) The needles should be small, slender, curved, and round-pointed (Figs. 322 and 323).

In the *after-care* the patient should be given some reliable urinary antiseptic. The matter of washing out the bladder through the retention catheter will depend on the predilection of the operator and the developments of the case. If bladder washing is employed, only a small amount of fluid at a time should be allowed in the bladder, otherwise bladder contractions may take place and the healing be thus interfered with.

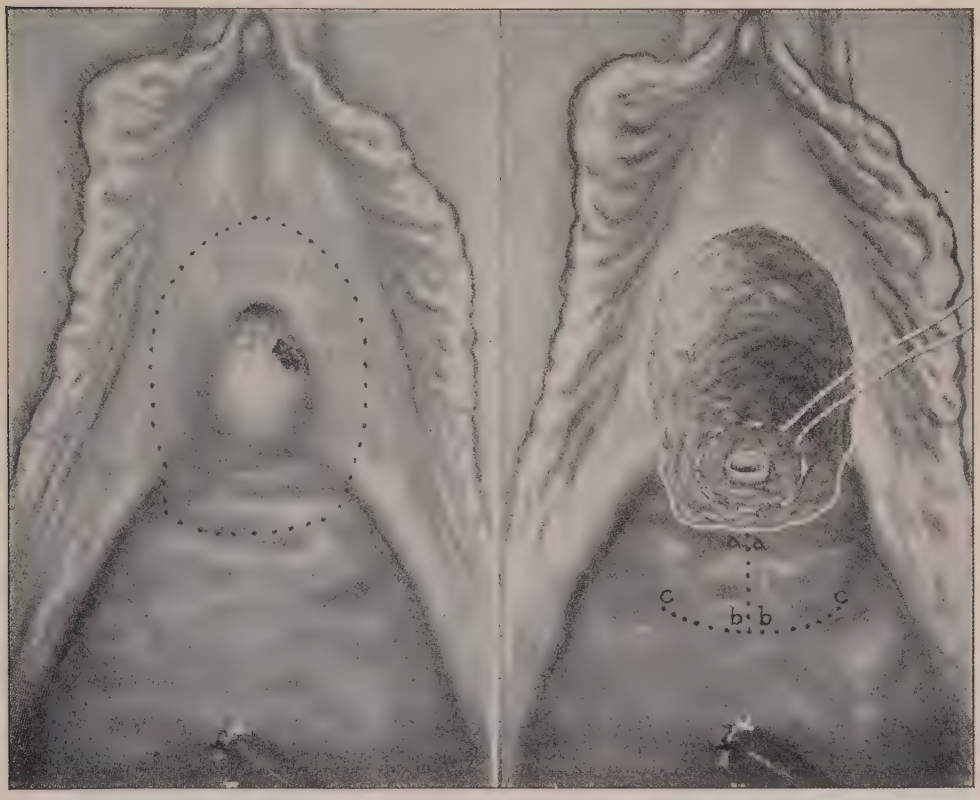


Fig. 716. Fig. 717.

Fig. 716. Showing by dotted outline the area of tissue to be removed in Operation for Carcinoma of the Urethra. The artificial vesico-vaginal opening for bladder drainage is shown with the catheter in place.

Fig. 717. The mass of tissue has been excised, back to the neck of the bladder. The first purse-string suture for piling up the tissue to give some sphincteric action is in place and ready to be tied. The flaps for assisting in the closure of the large raw area are indicated by the dotted outlines.

MALIGNANT DISEASE OF VAGINA.

In malignant disease of the vagina, the lymphatic involvement is of the deep glands, as indicated in Fig. 706. Hence the disease is likely to become "inoperable" very soon.

When operable, the operation follows the general principles of operation for

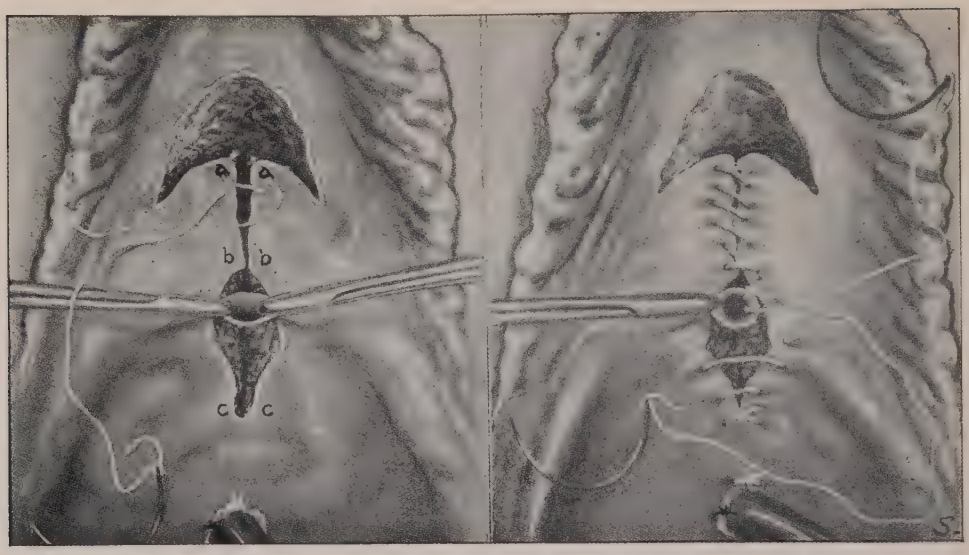


Fig. 718. Fig. 719.

Fig. 718. The flaps have been separated from the underlying tissues and have been raised above the new meatus urinarius, and are being sutured in that location by fine chromic catgut.

Fig. 719. The mucosa at the neck of the bladder is being sutured to the margins of the flaps. This suturing should be carried out in a way to secure accurate approximation and thus diminish the scar-tissue with its consequent distortion.

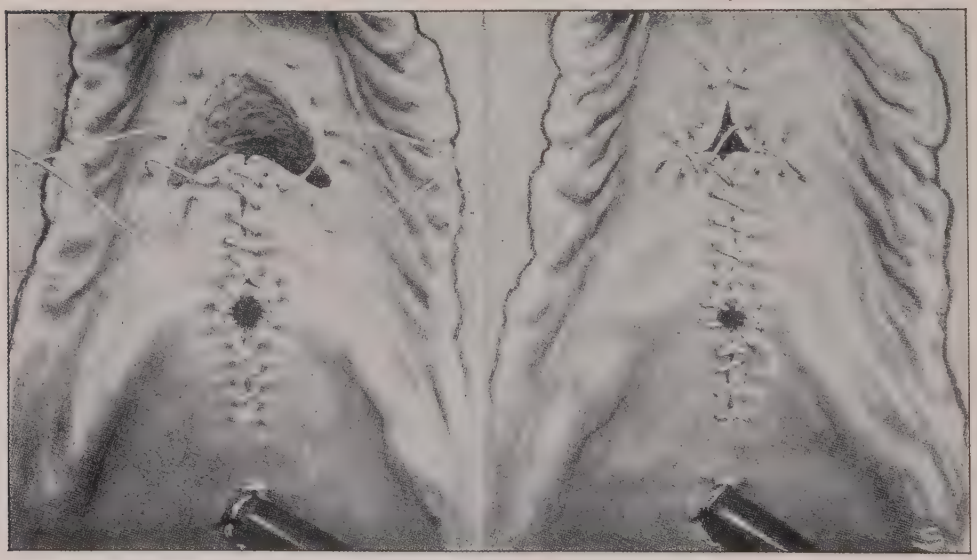


Fig. 720. Fig. 721.

Fig. 720. Closing the upper portion of the wound. If this cannot be closed without undue tension, a portion may be left to granulate.

Fig. 721. The operation almost completed.

malignant disease, viz., removal, along with the palpable lesion, of as much of the surrounding tissue and the regional lymphatics as practicable. If the lesion is in the upper portion of the vagina, the radical operation is very similar to that for cancer of the cervix uteri.

Primary cancer of the vagina is rare. In most cases, malignant disease of the vagina is secondary to malignant disease of the uterus, rectum, bladder, urethra or vulva.

NONMALIGNANT TUMORS.

The operative treatment of nonmalignant growths of the external genitals and vagina is the same as for similar growths elsewhere, namely excision of the growth and closure of the wound with the minimum disturbance of surrounding tissues. Particular care should be exercised to see that hemostasis is perfect, for the blood supply in this region is especially favorable to the formation of post-operative hematoma. Even a puncture with a hypodermic needle may cause such an hematoma. Extensive hemorrhage into the loose subcutaneous tissues is one of the troublesome features of wounds in this region, whether operative or accidental.

STASIS HYPERTROPHY.

Not infrequently large infiltrated masses are found about the vulva as a result of chronic ulceration and resulting scar-tissue which causes lymph stasis. Most of the cases commonly designated as "elephantiasis of the vulva" belong to this class and are simply cases of moderate irregular enlargement from lymph stasis due to scar-tissue. In the opinion of the author the term "elephantiasis of the vulva" should be reserved for those cases of enormous enlargement which are really elephantine. These are found usually in tropical countries and are due to the choking of the lymph spaces by the filaria hominis.

When masses due to stasis hypertrophy become so large as to be troublesome, they may be removed by excision and closure of the wound, wholly or partially, due care being exercised to control bleeding.

KRAUROSIS VULVÆ.

In cases of kraurosis vulvæ, if nonoperative measures fail to relieve the intolerable itching, excision of the involved surfaces is required. The excision should include the whole thickness of the skin over the whitened area and for a short distance beyond. After complete hemostasis, the adjacent skin is drawn over the raw area by means of tension sutures, relaxing incisions or flap formation being employed as needed.

Unless the suffering is marked and not amenable to palliative measures, the excision should be postponed until the process seems to have reached the limit of involvement. Otherwise, repeated excision may be necessary as the structures

become progressively involved. Of course, if the suffering is marked, successive excisions are fully justified. Again, if there seems a marked tendency to widespread involvement, it may be advisable to make a complete excision of the labia and clitoris even though all portions are not yet involved.

Before excision is resorted to, nonoperative measures should be given a good trial. Roentgenization gives much relief in this distressing affection, and may entirely obviate excision.

AFFECTIONS OF VULVO-VAGINAL GLAND.

Operative treatment is required in four conditions affecting the vulvo-vaginal glands—cyst, sinus, abscess and malignant disease.

The excision of a *cyst* of the vulvo-vaginal gland is a small operation but not as simple as might be imagined by the inexperienced. The tendency to

Fig. 722. Fig. 723. Fig. 724.

Figs. 722, 723 and 724. Enucleation of the Cyst of a Vulvo-vaginal Gland.
Fig. 722. Showing the relations of the cyst.
Fig. 723. The incision through the overlying tissues.
Fig. 724. The cyst almost enucleated.

hematoma, present in all the loose connective tissue of the genital tract, is especially marked here because of the masses of veins (the bulbs of the vestibule). Again, unless care is exercised a large depression on that side will be left after healing. This is avoided by dissecting close to the cyst wall, so as to remove no more tissue than necessary, and by drawing in the surrounding tissues during the suturing. The cyst should be dissected out without rupture if possible.

The steps in the excision of a cyst are shown in Figs. 722, 723, 724, 725, 726, and 727.

In the case of a *persistent sinus* of the vulvo-vaginal gland, the indurated discharging tract is excised in much the same way as a cyst. Before proceed-

ing to the excision, the sinus should be disinfected as far as possible by injectign iodine solution into it.

The treatment for an *abscess* of the vulvo-vaginal gland, is to open it at the inner thinned area and keep it open until the cavity is obliterated by granulation from the depths.

When a deep focus persists, causing a persistent sinus or recurring abscess, it may be removed by excision.

The operative treatment of *malignant disease* of the vulvo-vaginal gland is the same as for malignant disease of the vulva in general (Figs. 707 to 712). In addition, a portion of the vaginal wall may have to be removed. Exten-

Fig. 725. Fig. 726. Fig. 727.

Fig. 725. Ligating the vascular pedicle.
Fig. 726. Closing the wound with a continuous suture of 40-day catgut.
Fig. 727. Another method of closing—with silkworm-gut suture.

sion to lymphatic glands within the pelvis may take place early, hence the probability of recurrence is great.

IMPERFORATE HYMEN.

The treatment for imperforate hymen is crucial incision of the projecting membrane, with excision of most of it, particularly if it is a thick membrane. The cut edges may be sutured with catgut to check bleeding. The cavity above should be carefully washed out with a mild antiseptic solution and lightly packed with sterile gauze. Small particles of the old blood contained in the cavity necessarily remain adherent to the walls and these favor rapid growth of any bacteria that may find entrance. There is great danger of sepsis in these cases, particularly when the blood-distended cavity includes the uterus as well as the vagina, and consequently rigid aseptic technique must be employed throughout the operation and in the after-care. In some cases even the Fallopian tubes are distended with blood, greatly increasing the danger.

STENOSIS OF VAGINAL OPENING.

In some cases the vaginal opening is too small, not because of the hymen but because the opening is encroached upon by a thick perineum. This narrowing may be so marked as to interfere with coitus, particularly when there is an associated spasmodic condition of the muscles (vaginismus).

If the narrowing is so marked that it cannot be relieved by repeated stretching with a speculum, it may be permanently overcome by dividing the perineum and deeper tissues as indicated in Figs. 728 to 733. In the severe cases, especially if the spasmodic element is decided, particular care must be taken to divide the anterior portion of the levator sling sufficiently to give a good wide opening—wide enough to permit some spasm and yet not interfere seriously with coitus. The division of the deep spasmodic

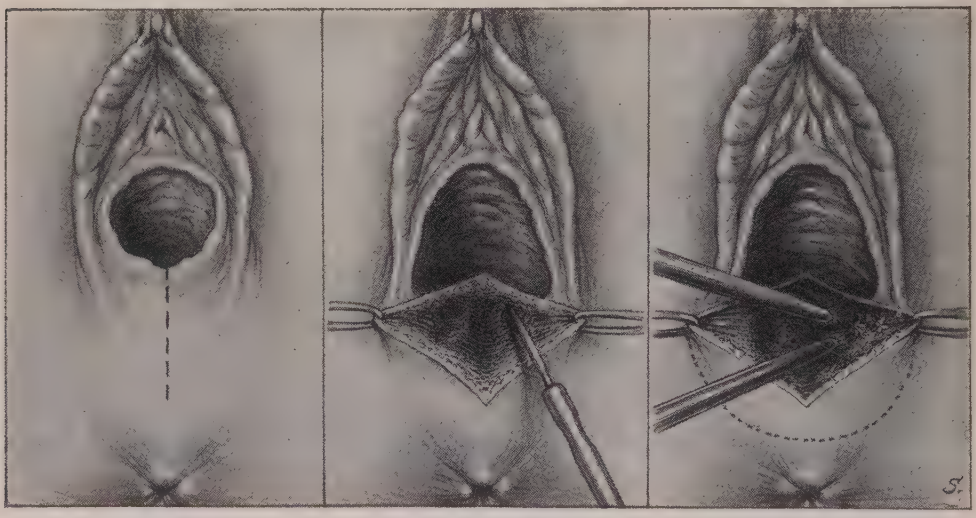


Fig. 728. Fig. 729. Fig. 730.

Fig. 728. Enlarging the stenosed or spasmodic vaginal opening. The broken line indicates the line of incision, which in severe cases should extend to the region of the sphincter ani, but of course taking care to stop short of that muscle.

Fig. 729. The perineum has been divided, and the deep resisting levator sling is being incised. This incision of the levator muscle is to be made on each side and is to be extended deeper, step by step as testing shows necessary to give a very wide opening. The opening must be enlarged sufficiently to allow for some subsequent spasmodic narrowing, for the tendency to spasm cannot be entirely overcome.

Fig. 730. The skin flap is loosened by undermining, as indicated by the dotted line, and the mucous flap is likewise loosened. This loosening of the flaps should be sufficiently extensive to allow them to be brought together (Fig. 732) without much tension. In order to cover the raw surface without undue tension in severe cases it may be necessary to shift formed flaps of skin or mucosa, the incisions for forming each flap being so placed that the uncut base carries the regular blood supply.

The free bleeding from division of the deep tissues is controlled first by forceps, and then each forceps-bite is caught with a suture-ligature of chromic catgut. All approximation should be in an antero-posterior direction, as indicated in Figs. 730 to 733. Side to side narrowing must be carefully avoided.

levator sling is best made laterally on each side after good exposure, as shown in Fig. 729. Particular care must be exercised in placing the suture-ligatures for hemostasis and approximation, to avoid narrowing of the enlarged opening. All tension and approximation should be in the longitudinal axis of the vagina and none transversely. To secure this approximation as shown in Figs. 731 to 733, flaps should be raised on both the mucous and the skin surfaces (see Fig. 730). As a rule, there will be some separation of the flap during healing because of the tension which cannot be entirely eliminated. For suturing, chromic catgut, forty-day, No. 2, seems to do as well as any other material. It lasts for a fairly long time even on the mucous surface. Non-

Fig. 731. Fig. 732. Fig. 733.

Fig. 731. All bleeding should be controlled and the deep tissues fully approximated, as here shown, before the superficial flaps are sutured together. Secure approximation of the deep tissues in their new relations, tends to lessen the tension on the superficial flaps.

Figs. 732 and 733. If tension-sutures are used as here indicated, it is well to select very heavy strands of the silkworm-gut, so as to diminish the rapidity of cutting through. The author is trying out doubled chromic catgut and also kangaroo tendon for this purpose.

absorbable sutures, such as silk or silkworm-gut would seem preferable. But experience shows that, with the unavoidable tension, they cut through so rapidly that the approximated flaps are released sooner than with the large-sized chromic catgut.

ATRESIA OF VAGINA.

Simple membraneous atresia of the vagina is treated the same as imperforate hymen, namely, by incision and excision of the obstructing tissue under aseptic precautions. Watchfulness, however, is required that absence of the upper portion of the vagina is not mistaken for a simple atresia. The distinguishing characteristic of the simple atresia is a collection of fluid (blood) above the obstruction in the upper part of the vagina.

ABSENCE OF VAGINA.

In certain cases of absence of the vagina, it is advisable to form a vagina from adjacent structures suitable for the purpose. It is only in recent years that this has been satisfactorily accomplished. The former attempts to construct a vagina by the transplantation of adjacent skin surfaces over the walls of an opening made into the connective tissue between the bladder and the rectum, were failures more or less. In spite of all precautions and in a comparatively short time contracting scar-tissue invalidated the new vagina in practically all cases. There are, however, two methods of forming a vagina that give permanent results—(a) by transplantation of a loop of intestine and (b) by resection of the rectum.

Transplantation of a Loop of Intestine.

In 1907, Baldwin devised a method which gave a permanently useful vagina. It consisted in the utilization of a loop of small intestine for the formation of a vagina. This operation has now been used successfully in a number of cases and by different operators and has proved exceedingly satisfactory. It is carried out as follows:

1. The patient, having been prepared for both perineal and abdominal operation (intestinal resection), is placed in the lithotomy position. A transverse incision is made just where the vaginal opening should be, between the meatus urinarius and the rectum. From this incision careful blunt dissection is made between the bladder and the rectum up to the peritoneum, as indicated in Fig. 734. Great care should be exercised to avoid breaking into the bladder or rectum. To prevent such a serious mishap, the work may, if necessary, be executed under the guidance of an index finger in the rectum and a sound in the bladder.

When the dissection has reached the peritoneum, the space is widened in all directions, a long artery forceps is pressed against the peritoneum, which is still unopened, and the canal is packed with gauze about the forceps, as shown in Fig. 735.

2. The patient is then put in the horizontal position and the abdomen is opened by median incision. A loop of ileum about twelve inches (30 cm.) long is selected for the formation of the vagina. The mesentery of the selected loop must be long enough to permit its being drawn into the connective tissue canal already made, without undue tension. Experience has shown that a loop ending four or five iches (12 cm.) from the ileocæcal valve is satisfactory. The intestinal contents are pressed out of the loop and the loop is resected, taking care to preserve its mesentery. Then the continuity of the small intestine is restored, as indicated in Fig. 736. For this anastomosis, Baldwin uses the Murphy button. The ends of the resected loop of bowel are securely inverted with purse-string sutures.

The peritoneum over the point of the forceps (Fig. 735) is then opened and the opening enlarged so as to permit the loop of intestine to be drawn through. An assistant then manipulates the forceps so as to grasp the middle of the loop of intestine, as indicated in Fig. 736. It is well to grasp only about half the thickness of the bowel. The loop is then drawn into the newly made canal between the bladder and rectum, as shown in Fig. 737. The peritoneum is now closed securely over the ends of the loop (Fig. 738), taking care to avoid injurious constriction of the mesentery. The abdomen is then closed.

3. The patient is again put into the lithotomy position. The loop of bowel is opened where caught with the forceps, and the edge of the opening is sutured all around to the skin margin, as indicated in Fig. 738. Each arm of

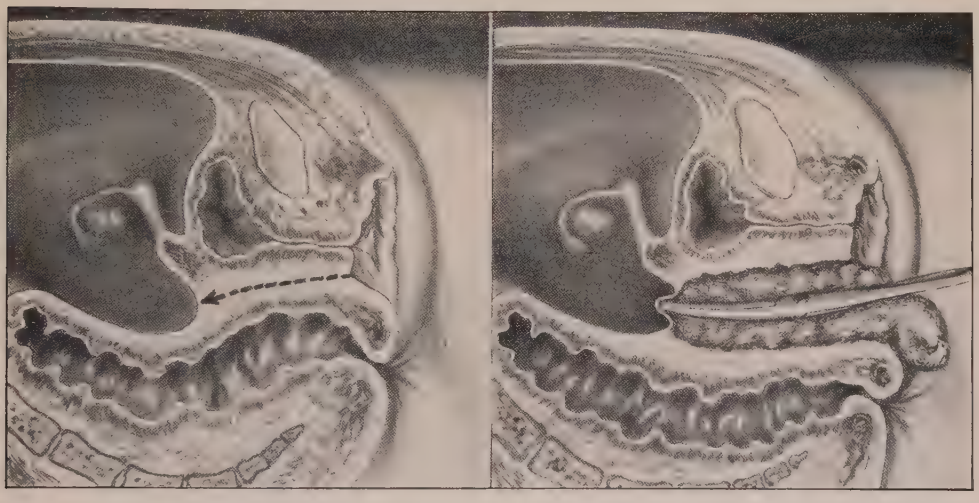


Fig. 734. Fig. 735.

Fig. 734. Construction of a Vagina from a Loop of Intestine. The deformity (absence of vagina) is here shown. The tissues are to be separated along the line indicated by the arrow, up to, but not through, the peritoneum.

Fig. 735. The canal for the vagina has been completed and packed with gauze. The forceps pushing against the peritoneum is to be used in a subsequent step of the operation.

the loop is then cleansed of all mucous and lightly packed with gauze to press the peritoneal surface of the bowel against the surrounding raw surfaces, so that union will readily take place.

4. After some weeks, when the patient has fully recovered from the operation, the septum between the two arms of the loop is divided. This may be accomplished safely by means of pressure necrosis. A long clamp is introduced, one blade in the upper and one in the lower arm of the loop. The clamp is then closed firmly and left in place until it cuts through, which takes about five days. A sedative may be required for the pain.

Another method is to use two clamps a short distance apart and immediately divide the septum, as indicated in Fig. 739. The clamps need to be

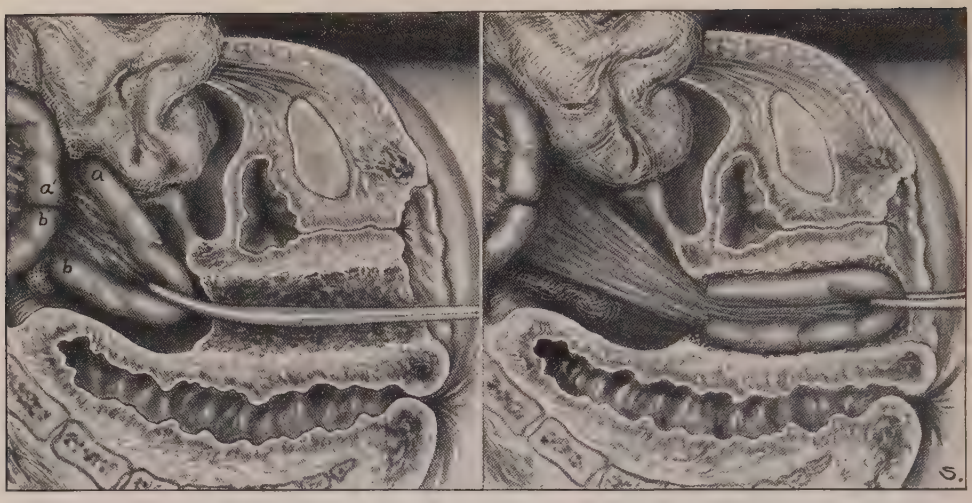


Fig. 736. Fig. 737.

Fig. 736. The intestinal resection, mentioned in the text, has been completed, and the intestinal loop has been grasped with the forceps preparatory to drawing it into the prepared canal.

Fig. 737. The intestinal loop drawn into place. The culdesac peritoneum should be closed over the ends of the loop, but not in a way to interfere with the circulation in the mesentery.

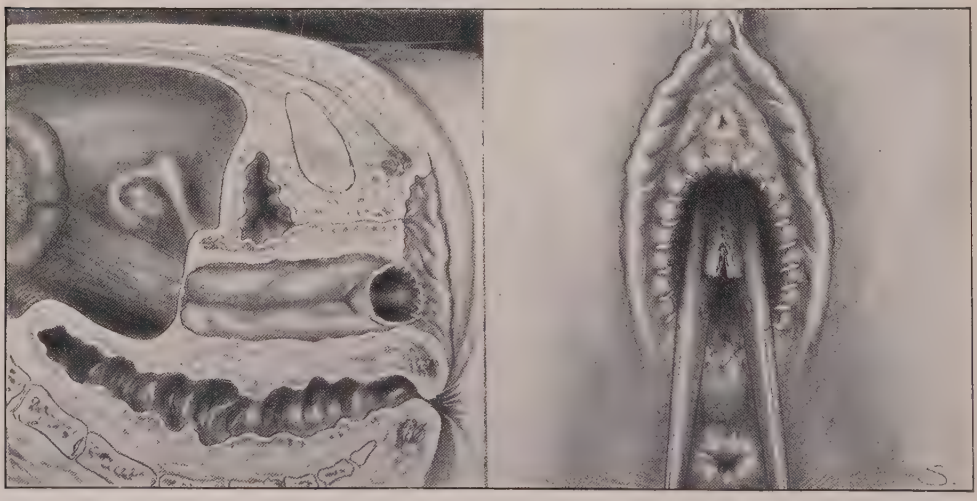


Fig. 738. Fig. 739.

Fig. 738. The intestinal loop in place and opened, and the margins of the opening sutured to the surrounding surface.

Fig. 739. Dividing the septum between the two portions of the intestinal loop. This is carried out some days after the operation, as explained in the text.

left on only long enough to insure against hemorrhage, i. e., twenty-four hours.

Baldwin, in reporting his fourth case (Jour. Amer. Med. Assoc., Vol. 54, 1910) makes the following instructive remarks:

"While studying the technique of this operation from a theoretical point of view, I took pains to examine the ileum and sigmoid in a large number of patients on whom I was making ordinary abdominal operations. Several hundred patients were thus examined and in all I found that there would be no difficulty in drawing down such a loop of ileum into the vagina or a loop of sigmoid if for any reason the ileum should not be found satisfactory. With either there would be plenty of slack of the mesentery so that the circulation would not be interfered with. I have always used, however, a loop of ileum, because resection of the ileum is safer than resection of the sigmoid. In all of my cases operative recovery was absolutely smooth and the new vagina seems to take the place very satisfactorily of the natural organ. I was induced to use the bowel for this purpose because a very extended study of the literature of artificial vaginas had shown that, in all cases of entire absence of vagina, other methods resulted in almost complete failure, although full of promise in many cases when the patient left the operating table. The favorite method of operating had been by transplantation of pieces of skin, to line the artificial canal. In all of these cases, however, to which I had access, the ultimate results had been very unsatisfactory owing to cicatricial contraction. By the use of the bowel a normal mucous membrane is provided, surrounded by normal connective and muscular tissue and with an ample blood supply. Theoretically and practically, therefore, such a vagina would seem to fulfill to the highest degree all the requirements.

"The dangers of operation are simply those inherent in any other deliberate resection and anastomosis of intestine, but the operation is one which should certainly not be undertaken by a tyro in surgery. My first operation took over two hours, the last one about half that time, and I think in an uncomplicated case the operation should be done in one hour. There is, of course, no hemorrhage to amount to anything, and if the field of operation is carefully protected there should be no shock. The danger, therefore, would be merely the danger of a possible infection from the intestine, and that danger in the hands of an expert is very slight. Nevertheless, the danger should be fully explained to the patient, who would then decide whether the operation would be worth while."

Wallace (Buffalo Med. Jour., Feb., 1911) reports a case in which he opened the abdomen expecting to do the Baldwin operation. Finding, however, the mesentery of the ileum was too short to permit a loop of it to be brought to the vulva, he utilized the sigmoid, resecting five inches of it that had a mesosigmoid with a good blood supply. One end was turned in and closed. The other end was drawn down and stitched to the vulva. The patient recovered and the ultimate result was excellent. Much anxiety was caused after the operation by the fact that the bowels did not move for ten days, that is, not until the Murphy button used for the anastomosis came away. He warns against the use of the button in the sigmoid as the feces are too hard to readily

pass through the small opening. In anastomosis after resection of the sigmoid, he prefers the invagination operation of Mayo.

Resection of Rectum.

In this method, devised by Schubert, the vagina is formed from a portion of the rectum which is resected and utilized in the plastic work. It has given excellent results, and there is no invasion of the peritoneal cavity with its attendant dangers. The operation is carried out as follows:

1. With the patient lying on the left side, the hymen is completely excised, but no deeper dissection is made. The sphincter ani is then moderately dilated and a circular incision is made around the anus at the junction of the skin and mucosa (white line). The rectal wall is then carefully dissected all around from the sphincter upward for about an inch (2.5 cm.), as indicated in Fig. 740. The bleeding may be checked and the rectum closed by a temporary suture. It is well to leave this suture long to facilitate a subsequent step in the operation.

2. The coccyx is excised. A longitudinal cut about four inches (10 cm.) long is made over the coccyx, the lower end of the incision extending to within two inches 5 cm.) of the anus. The cut is carried down to the bone, the fascia pushed aside and the coccyx seized with a bone forceps. By manipulation of the bone, the sacro-coccygeal joint is located. The coccyx is disarticulated from the sacrum and excised. The underlying pelvic fascia is divided by a longitudinal incision, exposing the rectum.

3. The rectum is drawn into the wound and a long double ligature passed around it four inches (12 cm.) above the anus. The ligature is divided, giving two ligatures. These are not to be tied about the rectum but are simply for isolating the rectum at this point. By separating the ligatures and manipulating them (Fig. 741) space is obtained for the introduction of a gauze-strip around the rectum by means of which the rectum may be pulled upon without damage.

The rectum is then pulled down and the upper portion isolated by doubly ligating the restraining bands and dividing them (Fig. 742). This process is continued until the upper part of the rectum is sufficiently freed to permit the point of intended division to be brought as low as the anus. The peritoneum is not to be opened but is to be kept pushed up out of the way.

The rectum is now compressed by intestinal clamps and the bowel cut across between the clamps. The upper cut end is temporarily closed by suture and enveloped in antiseptic gauze. The lower end is permanently closed by suture, the mucosa being inverted. The clamp is then removed and the closure made secure by one or two rows of reënforcing sutures (Fig. 743).

4. By blunt dissection an opening is made from the hymen upward and backward, so that it encounters the rectal wall at the upper limit of the dissected area. This new canal is enlarged to the capacity of two fingers. A

forceps is then introduced and the ends of the rectal suture are caught in it (Fig. 744). The forceps is withdrawn, drawing the attached end of the rectum up into the hymen opening. Here the temporary suture is removed and the margin of the rectum is sutured all around to the margin of the opening where the hymen was excised (Fig. 745).

The upper cut end of the rectum is now brought down to the anus (Fig. 745) where it is securely fastened by sutures. The first sutures are buried

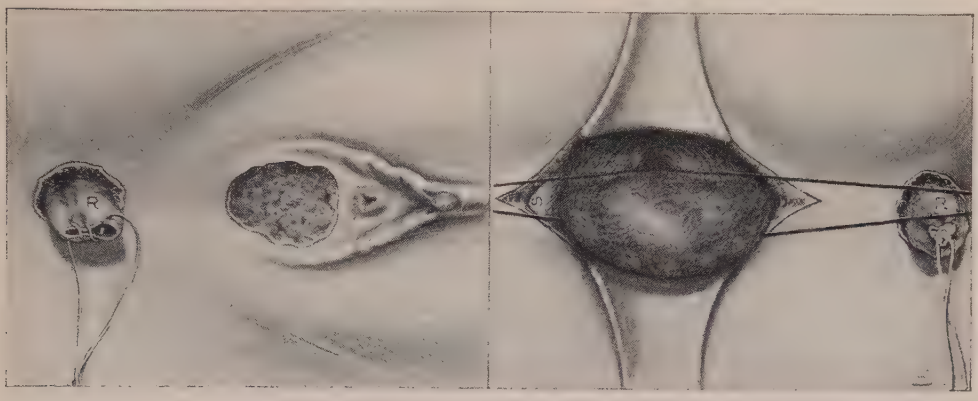


Fig. 740. Fig. 741.

Fig. 740. Construction of a Vagina by Resection of the Rectum. The surface-covering in the hymen-area has been excised, and the end of the rectum has been loosened by incision and dissection around the anus.

Fig. 741. An incision has been made over the coccyx, the bone removed and a loop of the rectum brought out. A double ligature has been introduced and divided, making two ligatures. By pulling these in opposite directions an opening is made in the vascular tissue beneath the rectum. Through this opening a strip of gauze is to be passed for making traction on the rectal loop.

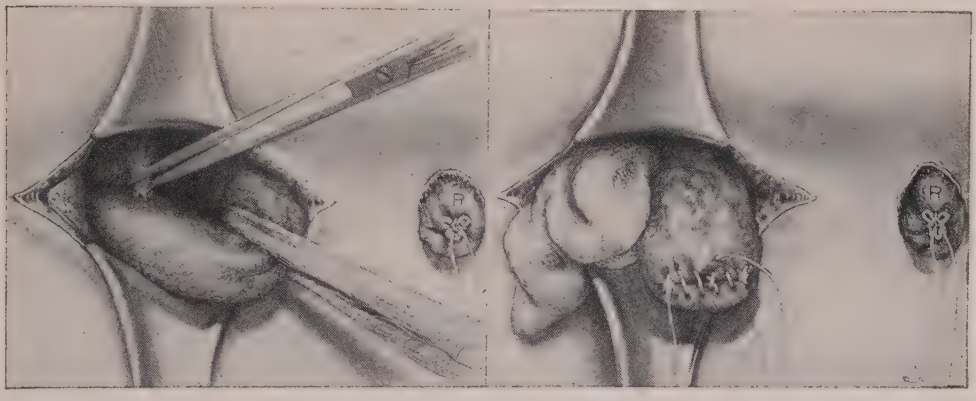


Fig. 742. Fig. 743.

Fig. 742. The gauze strip has been placed and traction is being made. As the loop of rectum is drawn down the resisting bands of tissue are ligated and divided, as here indicated.

Fig. 743. The loop of rectum has been divided about at the point where the double ligature was at first passed, that is, four inches (12 cm.) above the anus. At the point of division of the rectum the proximal end is closed temporarily and covered with gauze and the distal end is closed permanently with sutures, as here shown.

and deeply placed and unite the sides of the rectal tube to the adjacent sphincter. Then the end of the rectum is sutured securely to the skin margin around the anus.

5. In closing the coccygeal wound, a drain should be left in. Then the new vagina is opened by speculum, cleaned of mucus and lightly packed with sterile gauze. A piece of rubber tubing, wrapped with gauze and rubber sheeting, is placed in the rectum and the operation is finished.

Schubert, at the time of his report (Surgery, Gynecology and Obstetrics, Vol. 19, 1914), had operated on four patients. He states: "The healing took a regular course without trouble. The primary and secondary results were excellent. I heard of no complaint, either at the end of convalescence or after many years of observation. This method was employed by Flöel, by Franque, by Krömer, by Strassmann of Berlin and by Engelmann of Dortmund. Nine

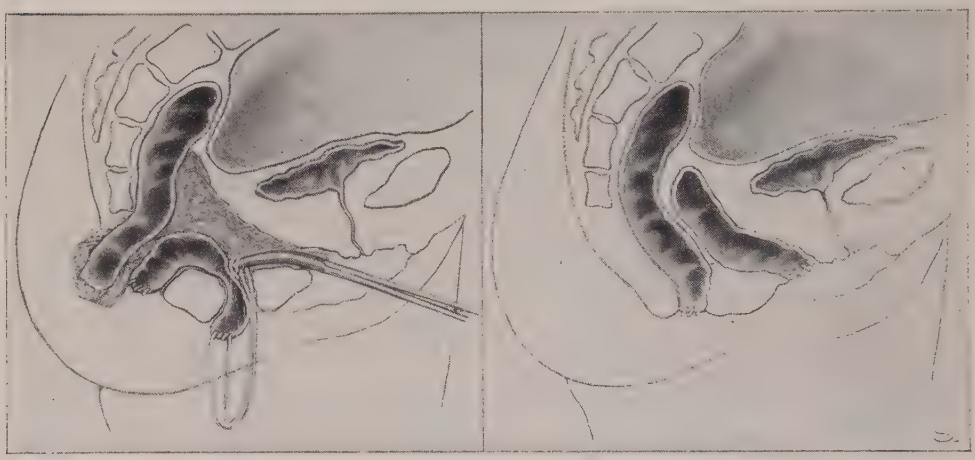


Fig. 744. Fig. 745.

Figs. 744 and 745. Sectional views, explaining late steps in the operation.

Fig. 744. The forceps for drawing forward the anal end of the rectum has been introduced from the hymen-area along the canal and is grasping the temporary suture closing the anal end of the rectum.

Fig. 745. The operation completed, as described in the text.

cases in which the method was employed have been observed up to the present time. All these surgeons approve of the simple manner of execution and report extremely satisfactory results." In Schubert's article will be found many interesting points in regard to this and other operations for the formation of a vagina, and also a review of the literature of the subject.

URETHROCELE.

Urethrocele is the term applied to a pocket situated in the urethrovaginal septum and communicating with the urethra (Fig. 746). It is due to suppuration in the septum, the pocket of pus finally discharging through the urethra

and the cavity remaining as a sinus or pocket. The origin of the suppuration is possibly in Skene's glands in most cases.

The treatment is to excise the pocket down to the urethra. When the excision is completed the tissues under the urethra are accurately approximated by buried sutures, as indicated in Fig. 747. Then the vaginal wound is closed by superficial sutures.

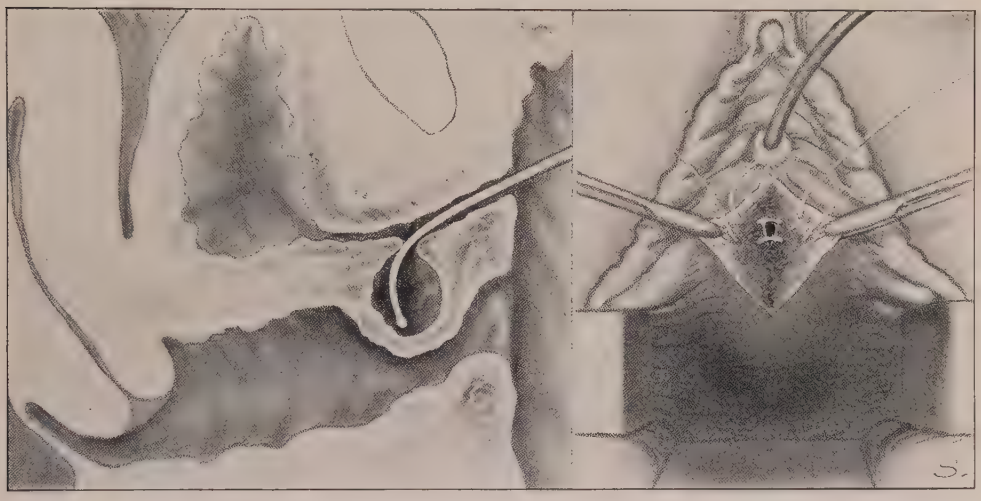


Fig. 746. Fig. 747.

Fig. 746. Urethrocele and the method of diagnosticating the same with a sound.

Fig. 747. Operation for Urethrocele. The sac has been excised and the suture for closing the opening is in place.

INFLAMMATION OF SKENE'S GLANDS.

When there is inflammation of Skene's glands that does not yield to suitable solutions injected with a fine needle, more radical treatment is needed. This radical treatment consists in laying open the affected gland towards the urethra with a delicate knife or scissors. This may be executed under local anesthesia, using first a strong cocaine solution for surface anesthetization and then injecting the tissues with novocaine solution.

DESTRUCTION OF URETHRA.

Destruction of the urethra is occasioned in most cases by severe ulceration. This severe ulceration is usually of syphilitic origin, and this feature of the case should receive careful investigation and necessary treatment before any attempt at surgical reconstruction is made.

In some cases the ulceration has simply separated the lower part of the urethra and adjacent tissues, allowing them to drop down as a flap, as indicated in Fig. 748. In that case the operation consists in denuding the upper and

lower flaps, leaving the urethral mucosa in the center as shown in Fig. 748. The lower flap is then approximated to the upper by sutures passed as indicated in Figs. 748 and 749. This plastic work, as well as all the extensive plastic work about the urethra, is to be preceded by the formation of a drainage opening in the base of the bladder, with a catheter fastened in the same (Figs. 713, 714, 715 and 748).

In other cases there has been destruction of tissue all about the urethra leaving an area of scar-tissue with a small hole in the center, from which the urine constantly escapes (Fig. 750). This presents a more difficult problem and unless care and judgment are exercised the attempt at repair will result only in more scar-tissue and more leakage.

The repair, in destruction of the urethra with loss of tissue and extensive scar formation, is executed in the following steps:

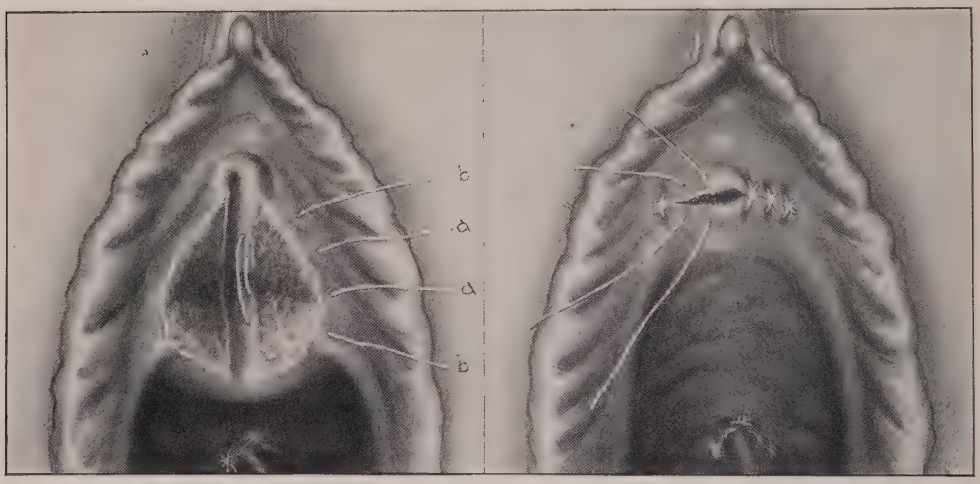


Fig. 748. Fig. 749.

Figs. 748 and 749. Restoration of a Urethra which has been laid open by ulceration.

Fig. 748. Denudation has been completed and two of the sutures are in place. Notice the vesico-vaginal opening with the catheter in place, for bladder drainage.

Fig. 749. The operation almost completed.

1. The usual temporary drainage through the base of the bladder is established (Figs. 713 to 715).

2. A circular incision is made about the opening and about one centimeter away, as indicated by the dotted circular line in Fig. 750. This extends only through the surface covering, which is carefully raised from the underlying tissue all around so that it forms a flap attached at the opening and extending forward, as shown in Fig. 751.

3. Four radial incisions are then made extending out past the scar-tissue area, as indicated by the radial dotted lines in Fig. 750. The flaps thus outlined are raised, as shown in Fig. 751. These flaps should be loosened well out-

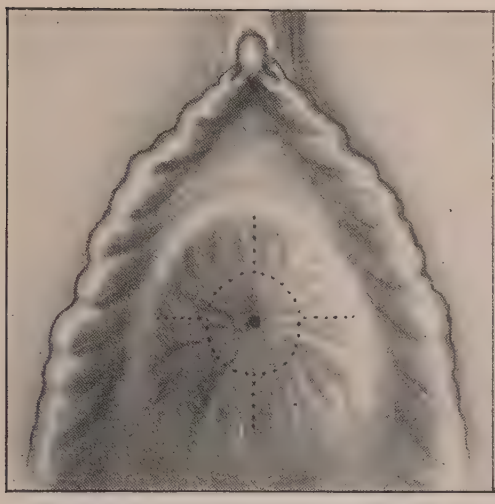


Fig. 750.

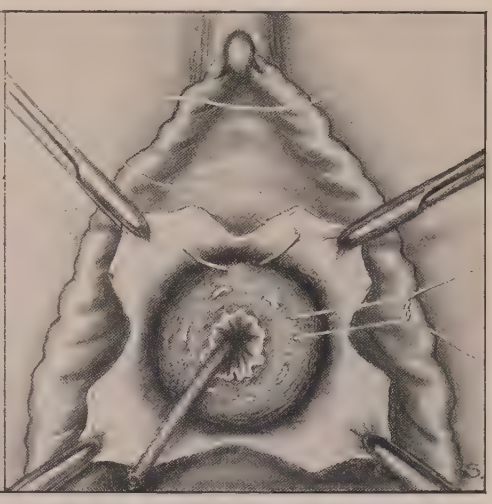


Fig. 751.

Figs. 750 and 751. Restoration of a Urethra which has been destroyed by extensive ulceration.

Fig. 750. The scar-tissue with the small opening in the center, from which the urine constantly dribbles. Incisions are to be made as indicated by the dotted lines.

Fig. 751. The incisions have been made and the flaps raised. The first purse-string suture has been passed and is ready to be tied. These circular sutures are preferably of fine chromic catgut (40-day), and are to be passed with a slender non-cutting needle.

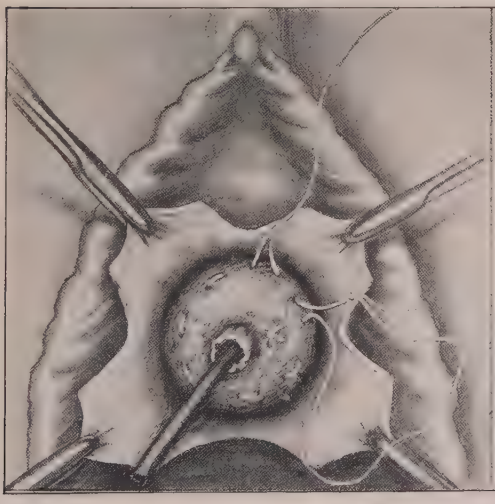


Fig. 752.

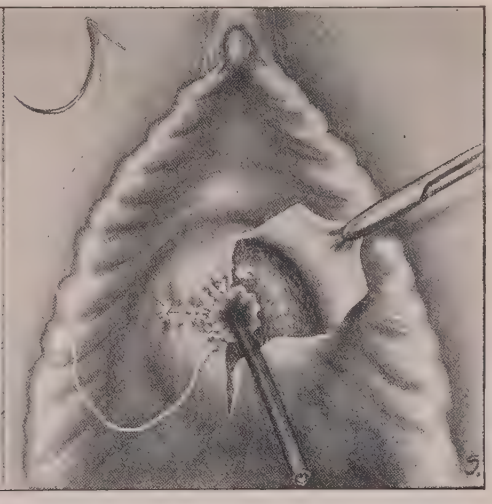


Fig. 753.

Fig. 752. The first suture has been tied and the second suture is almost completed.

Fig. 753. The purse-string sutures have been tied and the flaps are being sutured in place over the roll of piled-up tissue. If preferred, fine silk or linen may be used for suturing. It is troublesome to remove in the swollen and drawn-in tissues, but if interrupted sutures are used the ones difficult to remove may be allowed to cut themselves out.

ward past troublesome scar-tissue, so as to expose muscular tissue which may be drawn inward and piled up about the opening to produce sphincteric action.

4. A purse-string suture is now introduced, taking hold of the surrounding muscular tissue and when tied drawing it snugly about the central flap, converting it into a short canal. In Fig. 751 the first circular suture has been passed and is being tied, while the needle indicates the beginning of the second. When the first suture is tied down, the second suture will be much closer to the central opening. Two or more circular sutures are used, as needed to draw in a good roll of muscular and connective tissue about the central open-

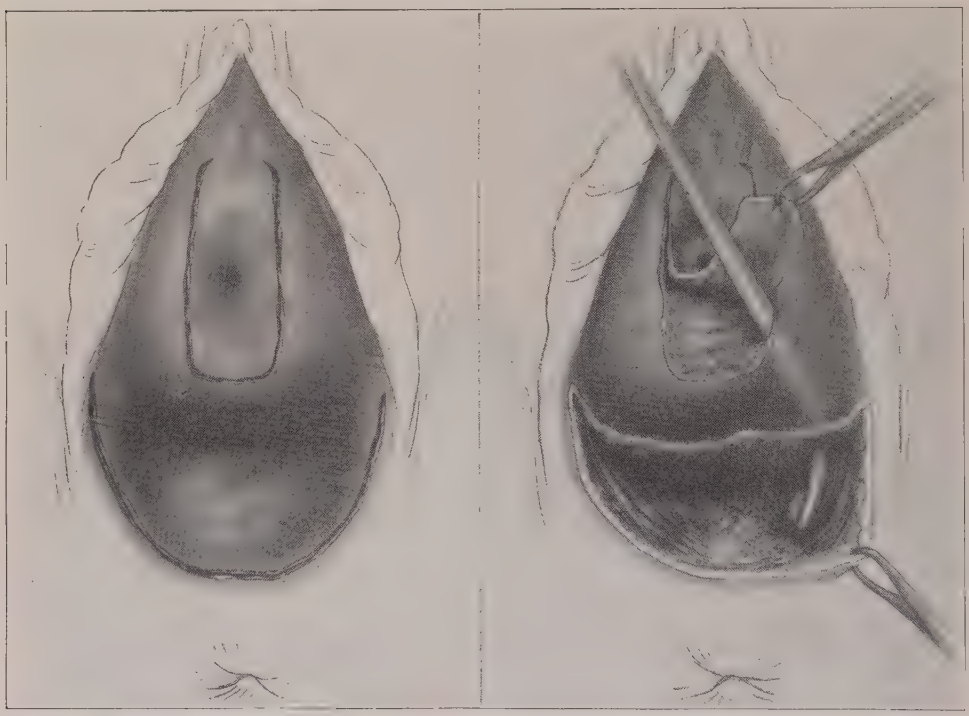


Fig. 754. Fig. 755.

Fig. 754. The U-shaped incision outlining the flaps for the new urethra. The upper ends of the incision are curved inward so the edges of the flap may be loosened and turned in. The perineal incision also has been made.

Fig. 755. The lower urethral flap and the vaginal flap have been raised, a strip of the left levator muscle isolated and severed at its lower end and a forceps introduced for drawing the levator strip up to the urethra.

ing. It is well to have a very small catheter in this central opening and to tie down the circular sutures rather firmly upon it. The circular sutures are completed as shown in Figs. 752 and 753.

5. The four flaps are then sewed over, as shown in Fig. 753, taking care to secure accurate approximation of the flaps about the urethral mucosa. The small catheter may be left in place for a few days or removed as preferred.

The author prefers the latter, unless the conditions are such that he fears obliteration of the opening by adhesions of its walls or margins.

Utilization of strip of levator muscle to form a new sphincter vesicæ. Taussig devised this operation for an unusually difficult case which had resisted several operative attempts at cure. The details of the case and the operation are admirably presented in his article (American Journal of Obstetrics, June, 1918). The steps are as follows:

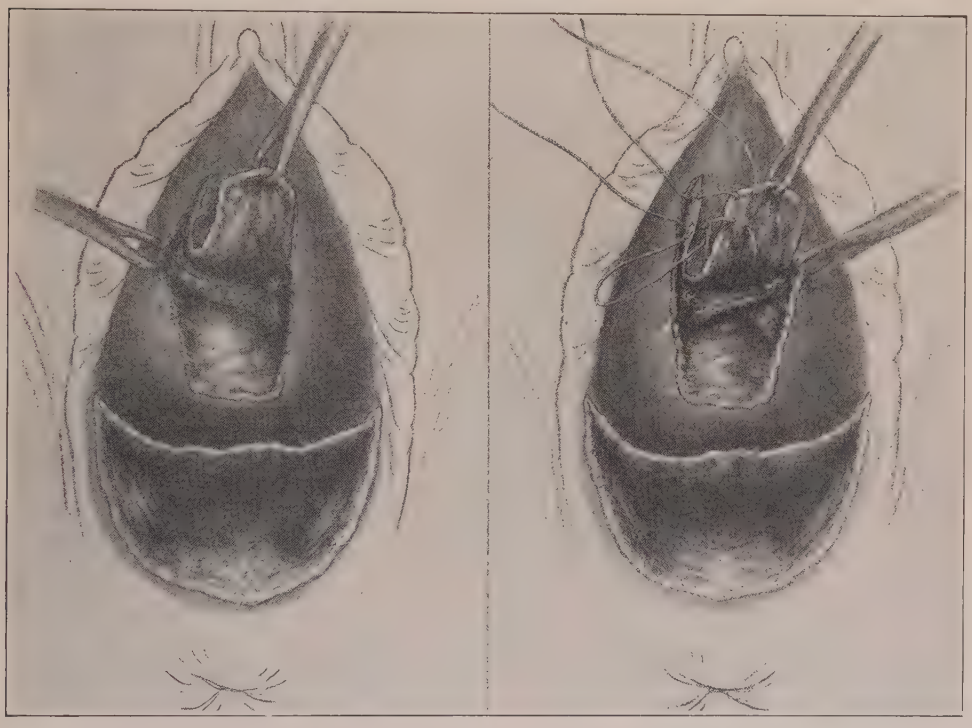


Fig. 756. Fig. 757.

Fig. 756. The left levator strip sutured in place.

Fig. 757. Both levator strips in place. Beginning to unite the flaps for the formation of the new urethra. Fine chromic catgut is the suture material used here.

1. A U-shaped incision is made about the urethra, as indicated in Fig. 754. An incision is made, also, at the vagino-perineal junction as in repair of the pelvic floor (Fig. 754).

2. The lower flap for the urethra and also the vaginal flap are each dissected up as shown in Fig. 755. The levator muscle is exposed on one side and a strip half an inch (1½ cm.) wide is isolated and severed at its lower end. A forceps is then introduced, as indicated in Fig. 755, and the end of the muscular strip grasped and brought up beside the urethra, and sutured there with chromic catgut (Fig. 756).

3. A similar maneuver is carried out on the other side, that strip also being fastened in place beside the urethra (Fig. 757).

4. The lower urethral flap is then sutured carefully with fine chromic catgut to the upper flap, the edges of the latter being loosened sufficiently to permit inversion by the sutures (Fig. 757).

5. The long raw surface is closed, preferably by interrupted linen or silk sutures, as indicated in Figs. 758 and 759. Relaxation incisions are made where needed, and each may be closed in the opposite direction by a silkworm-gut suture (Fig. 759).

6. The pelvic floor is repaired in the ordinary way (Fig. 759).

INCONTINENCE OF URINE.

The incontinence of urine here referred to is that unaccompanied by destruction of the urethra or other gross destructive lesion. It is found usually in women who have borne several children or passed through a very severe labor. It makes its appearance, or at least becomes most troublesome, in the

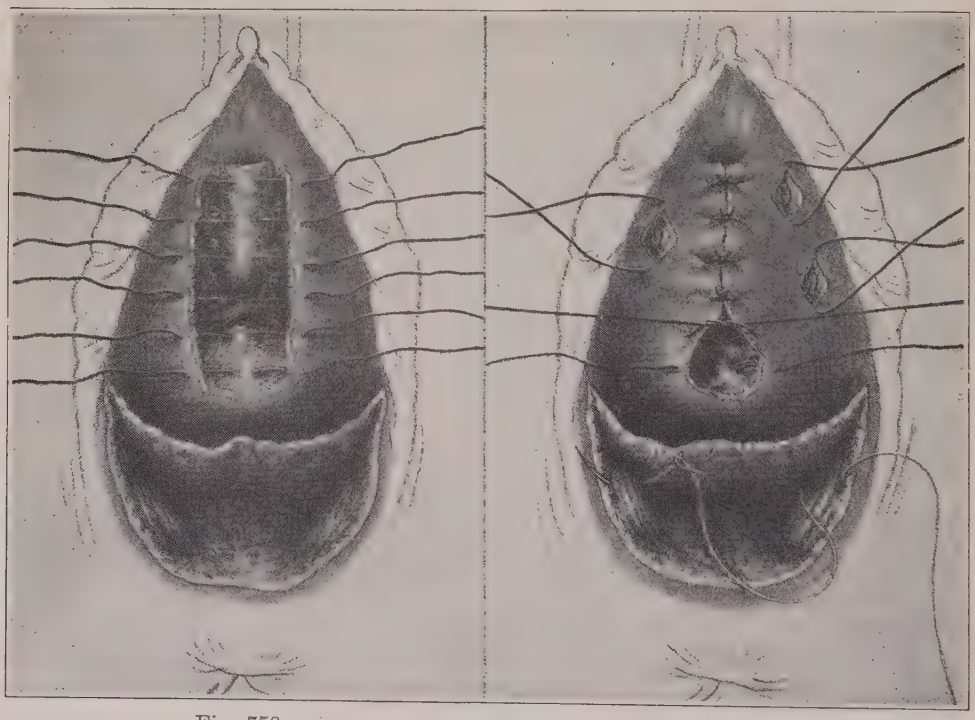


Fig. 758. Fig. 759.

Fig. 758. The urethral canal completely enclosed, and the linen sutures in place for closing over the long row area.

Fig. 759. The linen sutures tied, thus closing the long row area and reënforcing the repaired urethra. Two relaxing incisions are shown on the patient's left and one in the right, with sutures in place for closing.

majority of cases after the climacteric muscular atrophy begins. These observations indicate that it is dependent on two factors: (a) relaxation of the sphincter vesicæ and accessory muscles from overstretching in labor and (b) loss of compensating muscular control from senile changes. In severity it varies all the way from a slight inconvenience, due to escape of a small quantity of urine occasionally on coughing or laughing, to a constant dribbling of urine which keeps the patient in a most miserable condition.

In the operative treatment by the various methods, three effects are discernible—shortening of the relaxed sphincter vesicæ, shortening of the relaxed accessory muscles (pelvic floor) and narrowing of the urethral canal by stretching or twisting or compression.

In all cases in which there is relaxation of the pelvic floor, the relaxed floor must be repaired in order to give the necessary support to the base of the bladder and the urethra. This is required to give a lasting result. Also, if there is prolapse of the bladder in the form of cystocele alone or in the form of prolapse of the uterus and bladder, that must be taken care of in an efficient way if permanent continence is to be secured. Again, there is the matter of bladder irritability, causing loss of urine due to contractions of the bladder which are more or less involuntary or imperative. This irritability may be dependent on the condition of the urine, on conditions of the bladder surface or wall, on conditions around the bladder or on abnormalities in the nervous system. These larger features of the problem of urinary incontinence having been recognized, we are ready to consider the details of the operative work upon the urethra.

In the description of technique, the operative methods will be taken up in the following order:

Shortening of sphincter vesicæ.
Advancement of urethra.
Twisting of urethra with advancement.

Shortening of Sphincter Vesicæ.

This is the simplest operative method for overcoming the incontinence now under consideration, and is effective in most cases. It may be carried out by the simple infolding operation, with or without the Baldy tension suture, or, if preferred, the Kelly mattress suture may be employed.

Simple infolding operation. The anterior vaginal wall is divided by a short median longitudinal incision located over the posterior part of the urethra and the vesical neck (Fig. 760). The vaginal flap on each side is caught by a forceps and separated from the underlying tissues for a considerable distance (Fig. 760). Then with fine chromic catgut and a suitable needle, the lateral tissues are drawn to the center and infolded by two or three rows of buried sutures, as shown in Figs. 760 and 761. This has two effects. It narrows the canal by folding and compression and at the same time gathers up the relaxed

sphincter, thus shortening and strengthening it. The vaginal wall is then closed over by suture, any excess of wall being trimmed away. The pelvic floor is then repaired as necessary to support the base of the bladder and reënforce the repaired sphincter.

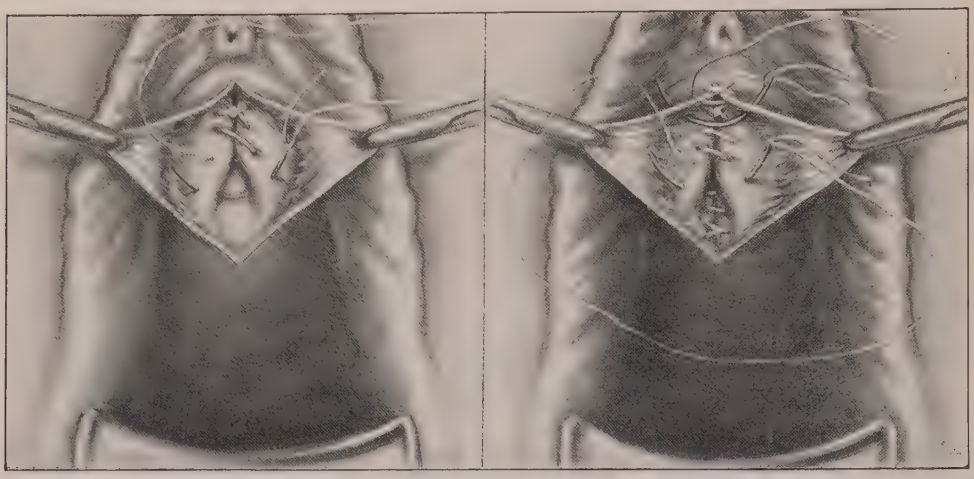


Fig. 760. Fig. 761.

Fig. 760. Operation for Incontinence of Urine, due to relaxation of the sphincter vesicæ. The vaginal wall has been incised, the sphincter area exposed and the constricting sutures are being passed.

Fig. 761. The second row of buried constricting sutures is being placed. The suture for closing the vaginal wound has been started.

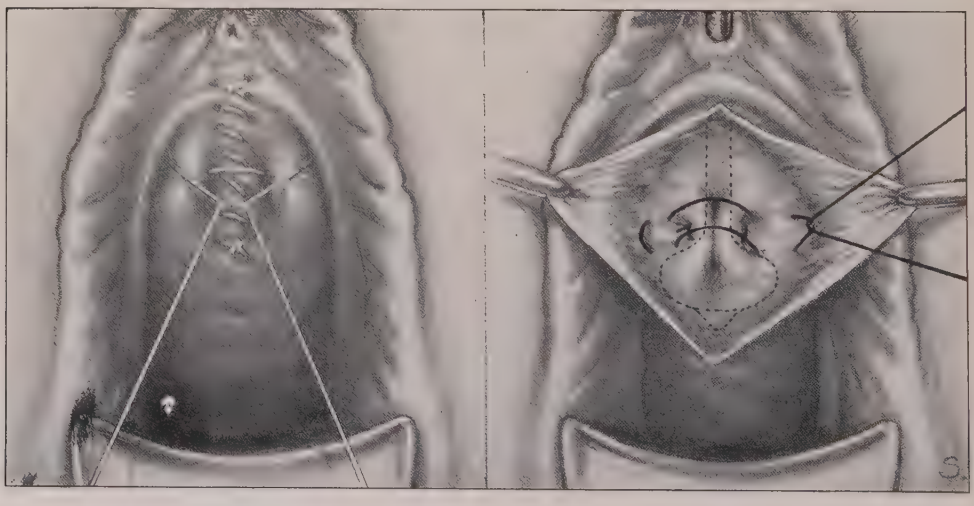


Fig. 762. Fig. 763.

Fig. 762. Baldy's reënforcing suture over the repaired area.

Fig. 763. Kelly's mattress sutures of fine silk for shortening the relaxed sphincter vesicæ. The location of the sphincter is determined by means of a retention catheter drawn down until its bulb is at the vesical outlet. The catheter is here shown in dotted outline.

Baldy tension suture. This is an extra suture passed through the vaginal wall on each side as shown in Fig. 762, and tied over the repaired area. Its function is to relieve the tension along the line of approximation in the center.

Kelly mattress sutures. These mattress sutures are of fine silk or linen and are placed as indicated in Fig. 763. In order to locate the sphincter region accurately, a retention catheter is introduced into the bladder and then withdrawn until the bulbous end is stopped at the vesical neck. In the illustration the catheter is shown in this position by dotted outline. The sphincter vesicæ lies just in front of the bulbous portion of the catheter, which can be identified by palpation. By this expedient the mattress suture may be placed accurately in the region of the sphincter muscle. The mattress sutures, when placed and tied, narrow the urethra and shorten the sphincter, practically the same as the infolding sutures previously described. The vaginal wall is then closed over, any excess being removed.

Advancement of Urethra.

This method of narrowing the urethra, devised by Pawlik and improved by Dudley, is carried out as follows: The upper and lateral portions of the covering of the vestibule are removed giving a horse-shoe shaped area of de-

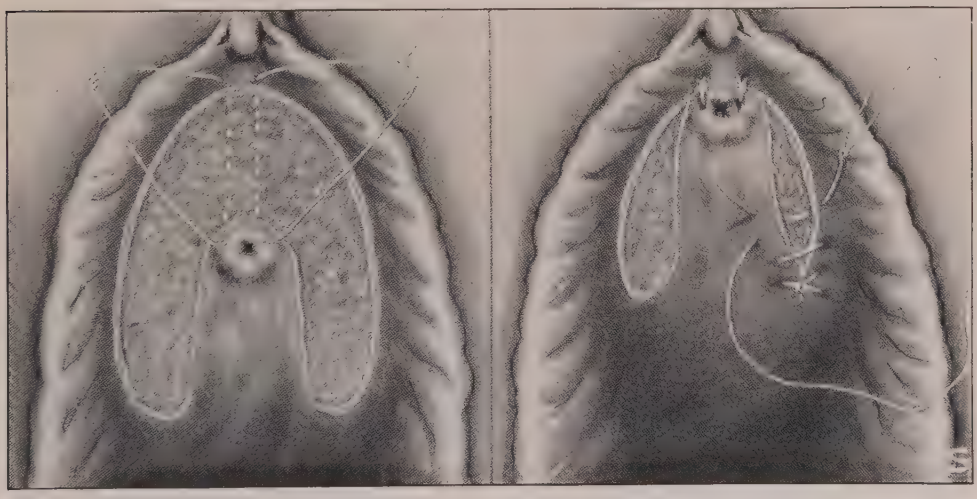


Fig. 764. Fig. 765.

Figs. 764 and 765. Advancement of the Urethra, after the method of Dudley.

Figs. 764. The denudation completed and two sutures in place. It is well to use one or two tension sutures of silkworm-gut on each side where tension is greatest.

Fig. 765. The urethra drawn forward and the lateral portion of the wound being closed.

nudation, as shown in Fig. 764. Sutures are then passed which, when tied, draw the meatus forward to just beneath the clitoris, as shown in Figs. 764 and 765. The effect of this is to stretch the urethra over the resisting struc-

tures beneath (pubic arch and overlying soft parts). The narrowing thus produced is augmented by the lateral sutures (Figs. 765, 766 and 767), which are so placed as to produce decided lateral tension. In addition, the approximation of the lateral edges to the central strip (Figs. 765 and 766) produce a slight piling up of the tissue in the sphincter region. Each of these three effects aids some in effecting control of the urine, and the operation with the subsequent scar-tissue contraction produces a satisfactory result in a considerable proportion of cases. Of course, the urethral operation must be supplemented by any required work on the pelvic floor or base of the bladder.

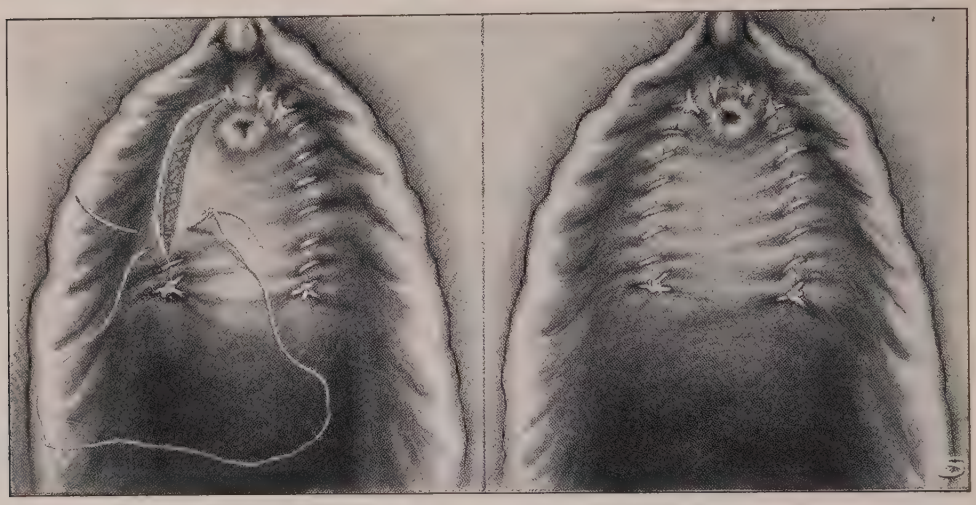


Fig. 766. Fig. 767.

Fig. 766. Closing the wound on the other side.

Fig. 767. The operation completed. As previously stated, it is well to place one or two tension sutures of silkworm-gut on each side.

Twisting of Urethra with Advancement.

In the very difficult cases of incontinence of urine with relaxation, the Gersuny operation, which consists in isolation of the urethra and twisting of the same for 180 to 360 degrees, held the field for many years. Pousson combined the advancement of Pawlik with the twisting of Gersuny with good results. Ries has still further advanced the effectiveness of this operation by drawing the twisted urethra beneath the surface covering of the vestibule (Figs. 769 and 770) instead of removing this covering. This gives a more secure forward fastening of the urethra and at the same time reduces the amount of troublesome scar-tissue immediately surrounding the meatus. He also excises the excess of vaginal wall at the vesical neck and thus, in the approximation, secures considerable constriction of the tissues in this vicinity. This operation produces the four effects of torsion of the urethra, advancement of the urethra, piling up of tissue in the region of the vesical sphincter

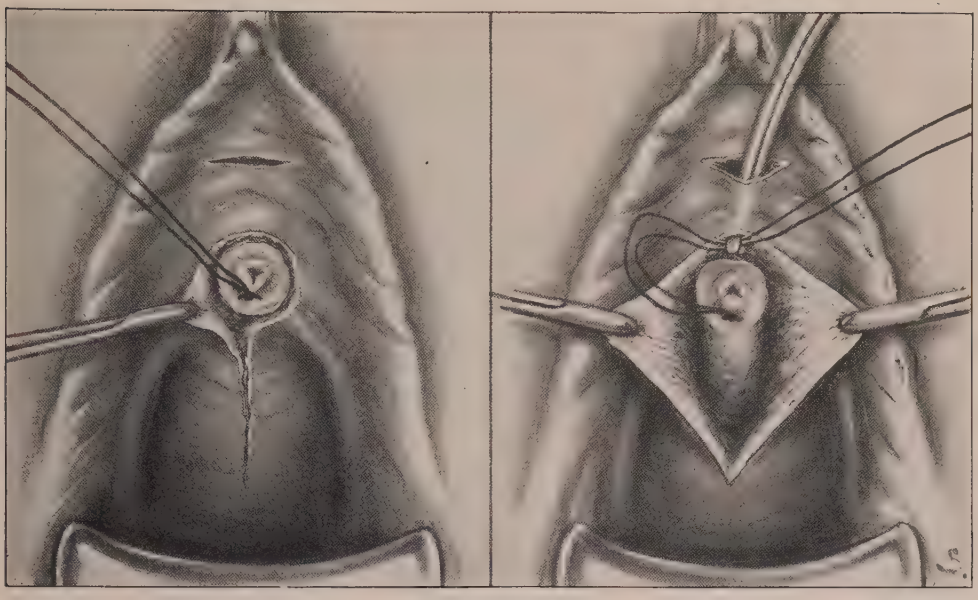


Fig. 768. Fig. 769.

Figs. 768 and 769. Advancement and Twisting of the Urethra, after the method of Ries.
Fig. 768. The incisions for the operation, and the urethra being separated.
Fig. 769. The urethra separated and the forceps in place for drawing it forward.

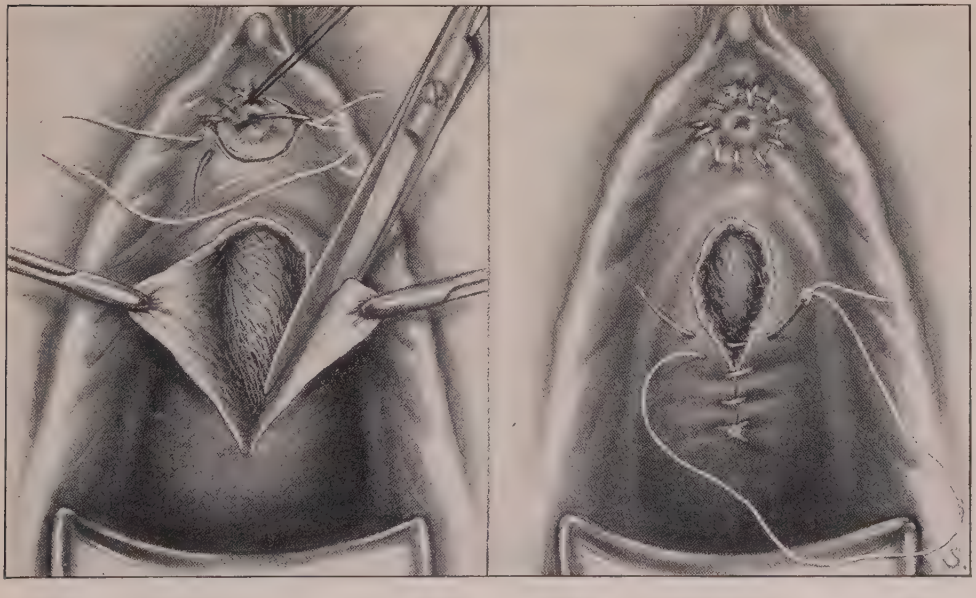


Fig. 770. Fig. 771.

Fig. 770. Suturing the advanced and twisted urethra in place. Redundant tissue of the vaginal wall is being excised.
Fig. 771. Closing the wound over the advanced and twisted urethra.

and compression of the urethra by lateral tension (Fig. 771). It is carried out in the following steps:

1. A circular incision is made a short distance from the meatus urinarius, as shown in Fig. 768. At the lower border of the circle the incision is carried downward and backward in the median line to the vesical neck. The flaps are raised and the urethra isolated, as indicated in Fig 769. Care should be taken to avoid rough handling of the urethra or too close approach to its lumen. It is important that the nutrition of the urethral tissues be not unnecessarily disturbed. Otherwise, the isolated, twisted and constricted urethra may slough.

2. A temporary silk ligature is tied beneath the meatus and the ends left long, as shown in Fig. 768. A short transverse incision is made in the floor of the vestibule just beneath the clitoris, as shown in Fig. 768. By blunt dissection with a forceps a canal of proper size is made downward beneath the intervening strip of surface-covering, and the ligature is grasped, as indicated in Fig. 769. By means of the forceps and ligature, the distal end of the urethra is drawn under the bridge of tissue and out at the transverse incision beneath the clitoris. At the same time the tension on the ligature twists the urethra 180 degrees, as shown in Figs. 769 and 770. If it is desired to produce greater torsion, this may be easily accomplished by carrying the ligature still farther to the patient's left.

When the end of the urethra is arranged as desired, it is sutured all around to the margin of the transverse opening, which is opened somewhat into a circle to accommodate the end of the urethra as shown in Figs. 770 and 771.

3. The excess of vaginal wall is then trimmed away (Fig. 770) and the flaps are approximated over the twisted urethra, as shown in Fig. 771. At the vesical end of the urethra there should be some tension, as indicated in the illustration, but not enough to jeopardize the nutrition of the isolated and twisted urethra.

CHAPTER XIV.

DISTURBANCES OF FUNCTION.

The disturbances of function which at times require operative treatment will be taken up in the following order:

Dysmenorrhœa.
Menorrhagia and Metrorrhagia.
Amenorrhœa and Scanty Menstruation.
Dyspareunia.
Sterility.

The reader understands, of course, that these are only symptoms, due in different cases to different causes. When a patient comes complaining of any one of these symptoms, the physician's task is to determine the cause in that particular case, and employ treatment accordingly. To suppose that there is an operative cure-all for any of these distressing symptoms is to fail utterly to comprehend their significance. In some cases they are dependent partly or wholly on conditions which may be removed mechanically by operation. In other cases they are dependent on conditions that go to the very foundation of nutrition and assimilation, many of the problems of which we are only beginning to understand. In regard to these disturbances, the nonoperative treatment (medicinal, dietetic and hygienic) is on the whole more important than the operative and is becoming increasingly so as we see deeper into the function and interrelation of gland and muscle and nerve cell.

In certain cases, however, of each of these disturbances, operative treatment can aid materially in overcoming the trouble, and it is these operative cases only that are here considered. Disturbances of function in general have been taken up in detail by the author in another work (Textbook—Diseases of Women).

DYSMENORRHŒA.

There are two factors in painful menstruation that may be influenced more or less by operative treatment, viz., obstruction and uterine malnutrition. Both of these factors are in evidence in that very large class of cases of severe dysmenorrhœa associated with imperfect development of the uterus, anteflexion of the cervix and more or less stenosis of the cervical canal. Most cases of dysmenorrhœa in the virgin belong in this class.

The operative measures which have been found to aid materially in these cases will be considered under the following headings:

Dilatation and Curettage.
Same, Followed by Stem Pessary.
Posterior Division of the Cervix.
Bilateral Incision of the Cervix.
Intraperitoneal Division of Cervical Ring.
Choice of Operative Method.

Dilatation and Curettage.

A thorough dilatation of the cervix under anesthesia, to overcome the obstruction, with curettage, to stimulate the nutrition, produces decided benefit in nearly all cases. In a large proportion of cases there is marked benefit for periods of a few months to several years. Some patients are relieved permanently. In those cases in which the pain returns, it is seldom as severe as before operation. In a small proportion of cases there is no improvement. In these cases the pain is not from obstruction but is mostly neurologic in character.

When this operation is expected to permanently relieve all cases, it will prove disappointing. On the other hand, when it is depended upon only in the cases presenting marked obstructive pain and when the necessarily temporary character of the dilatation is kept in mind, there will be but little disappointment.

The details of dilatation and curettage have already been described and illustrated (Figs. 377 to 382).

Stem Pessary After Dilatation.

Contraction of the dilated tissues of the cervix no doubt begins almost as soon as the dilator is removed, and continues until only a very small portion of the former dilatation remains. In some cases this small remaining dilatation is sufficient, even with the menstrual swelling of the mucosa, to permit free escape of menstrual blood without obstructive pain. In many cases, however, this remaining dilatation is so small that, with the menstrual swelling of mucosa and in some cases contractions of muscular tissue, the escape of uterine contents (fluid blood, clotted blood and sometimes shreds of mucosa) is interfered with and obstructive pain results.

Numerous efforts have been made to secure a permanent dilatation of sufficient extent to prevent recurrence of obstructive pain. For this purpose the stem pessary has been used to maintain moderate dilatation for ten days to several weeks after thorough dilatation. In former years the stem pessary fell under condemnation because of the many cases of pelvic inflammation resulting from its use. This was due partly to imperfect asepsis and partly to poor selection of cases. In recent years, on account of improvement in aseptic technique and better selection of cases, the stem pessary in various forms has again come into use, with great benefit to the class of patients under consideration.

Technique. To render the use of the stem pessary safe and effective there are certain points that must be kept in mind.

1. There must be no infection within the uterus nor around it, in the tubes, ovaries, peritoneum or connective tissue.

2. The stem must be introduced under strict antiseptic precautions, the same as for any cutting operation in the vagina.

3. The introduction of the stem should be immediately preceded by a thorough dilatation of the cervix, and it is advisable in underdeveloped uteri to curet for the nutritive effect.

4. The stem, which is to be retained for several weeks, should be of large size and smooth surface—the larger the better, within limits that can be readily introduced and comfortably worn. A diameter of three-eighths of an inch (1 cm.) is satisfactory. Sharp or narrow edges tend to ulcerate into adjacent tissues. Slender wire stems often become buried in the cervical tissues when worn for several weeks or months. Grooves or rough places favor lodgment of

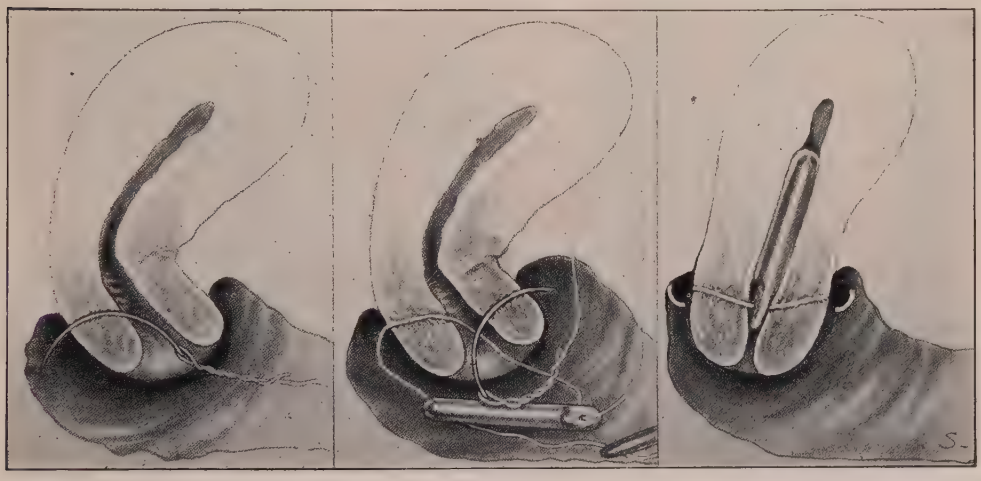


Fig. 772. Fig. 773. Fig. 774.

Figs. 772, 773 and 774. Fastening the glass Stem pessary in the uterus.
Fig. 722. Introducing the silver suture through the posterior wall of the cervix.
Fig. 773. Introducing the suture through the anterior portion of the cervix.
Fig. 774. The stem in place and the holding suture fastened with shot and cut short.

secretion and subsequent decomposition and irritation. Small stems and even wire stem and springs (e. g., Outerbridge's) may be advantageously used in office practice to give temporary relief. But the cases under consideration are those in which the stem is introduced after thorough dilatation and is usually to be left in for a considerable period.

5. The stem should be so shaped that it will stay in the canal without sutures. In the author's experience the stem shown in Fig. 775-f has proved most satisfactory. This stem is long enough to extend well into the endometrial cavity, and the bulbous end and shoulder fit above the internal os and hold the stem in the canal. This stem is self-retaining in nearly all cases.

Some gynecologists prefer the Baldwin glass stem (Fig. 775-a), which is fastened entirely within the uterine cavity with a silver wire suture as shown in Figs. 772 to 774, or the Dickinson silver stem (Fig. 775-b), which is also an intrauterine stem and is held in place by resting on a suture passed just below it.

6. All work is to be executed under strict asepsis. The patient is to be prepared as for any vaginal operation. After thorough dilatation and curettage and swabbing of the cavity, the stem should be introduced so that the bulbous end and shoulder lie well above the internal os.

7. The stem may be left in the uterus from a week to several weeks. Ordinarily it is removed when the patient is ready to leave the hospital. However in cases of marked stenosis it may be left in for several weeks at home. In the meantime sufficient supervision is to be exercised to detect promptly any

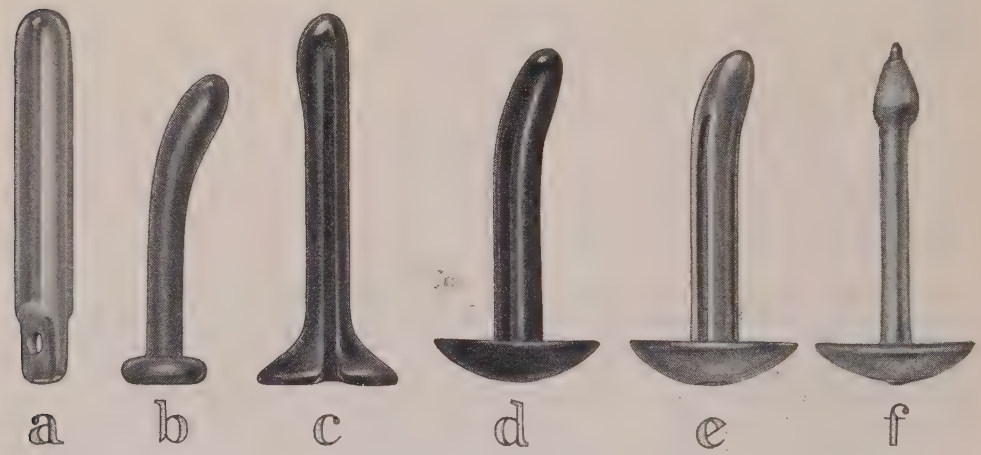


Fig. 775. Stem Pessaries. *a*, Baldwin's glass stem. *b*, Dickinson's silver stem. Both of the stems just mentioned are to be used entirely within the uterus, that is, they are wholly intrauterine. The other stems (*c, d, e, f*) lie partly within the uterus and partly in the vagina, that is, they are utero-vaginal stems. *c*. Wylie's hard rubber stem. *d*. Boldt's hard rubber stem. *e*, Aluminum stem of the same shape. *f*, Aluminum stem with bulbous end and shoulder, to make it self-retaining. In the author's experience this has proved the most satisfactory form of stem (see text).

disturbance that may be caused by it. After two weeks the patient may be about her usual activities, provided there is no irritation about the stem as indicated by discomfort. It is well to avoid long walks or other prolonged exertion that might occasion irritation from the stem. Douches may be employed as indicated by the amount and character of the discharge.

Posterior Division of the Cervix.

Since the time of Sims, incisions into the cervix (discission) have been frequently employed to overcome the stenosis. These incisions varied in location and depth. Some relief was afforded, though in a large proportion of the cases

the incision did not extend high enough to relieve the constriction at the internal os. Even in those cases where the division of tissue did extend to the internal os, the marked relief was often only temporary because the divided tissues soon reunited.

Dudley devised a method which not only divided the constricting tissues at the internal os but held them apart more or less by interposing other tissue. The posterior wall of the cervix was divided back to and including the internal os, hence the term "posterior division of the cervix." Above the vaginal fornix care should be exercised that the division does not extend to the peritoneum. The condition to be treated (anteflexion of the cervix) is indicated in Fig. 776, and the result of the operation, when effectively carried out, is indicated in Fig. 777. The canal is straightened, shortened and widened throughout, and the method of suturing tends to give a comparative permanence to the result.

Fig. 776.

Fig. 777.

Figs. 776 and 777. Posterior Division of the Cervix Uteri (Dudley Operation).

Fig. 776. The condition requiring operation—anteflexion of the cervix with stenosis of the internal os.

Fig. 777. The effect of the operation in widening the canal and overcoming the stenosis about the internal os.

Technique. The first step is a thorough dilatation and, ordinarily, a curettage for its nutritive effect. In the course of the dilatation the dilator must pass well above the internal os (Fig. 778). Wide dilatation at this point facilitates the deep and difficult part of the operation.

After satisfactory dilatation and curettage, the posterior lip of the cervix is divided in the median line back to the vagino-cervical junction, preferably with

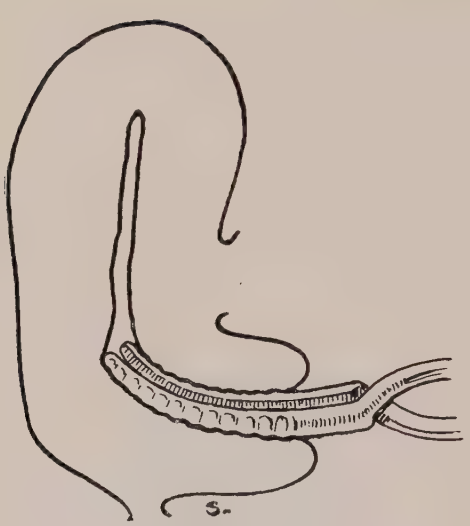


Fig. 778.

Fig. 779.

Fig. 778. Dilating the cervix, which is the first step in the operation of posterior division of the cervix.

Fig. 779. The scissors in place for division of the posterior wall of the cervix. A strong pair of sharp scissors is most convenient for this division, though a knife may be used if preferred. The higher division is preferably made with a knife, as shown in the next illustration.

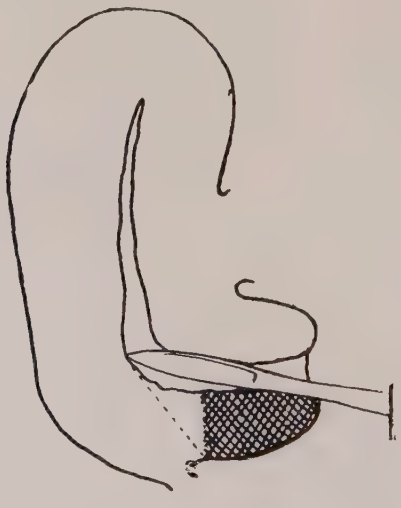


Fig. 780.

Fig. 781.

Fig. 780. Completing the division of the posterior wall up past the internal os. The dotted line indicates the limit of the necessary division. This division of tissue by the knife is made a little at a time under the guidance of the finger.

Fig. 781. The necessary division of tissue completed, permitting the finger to be passed up through the internal os.

strong scissors, as indicated in Fig. 779. This carries the division back as indicated by the shaded area in Fig. 780. From this point up the division is preferably made with a knife, under guidance of the finger. The important points are (a) to secure adequate widening of the internal os and (b) to avoid breaking through into the peritoneal cavity. Of course, with everything aseptic, as it should be in this operative work, incision through the peritoneum would not necessarily have serious consequences, but it adds an unnecessary element of danger and hence should be avoided. The tissue to be divided is indicated in Fig. 780 by the broken line from the knife point downward. The division is made, a part at a time, under the guidance of the finger, which, by frequent explorations, determines when sufficient division has been secured. The incision should be continued until the finger can be easily introduced through the internal os, as indicated in Fig. 781.

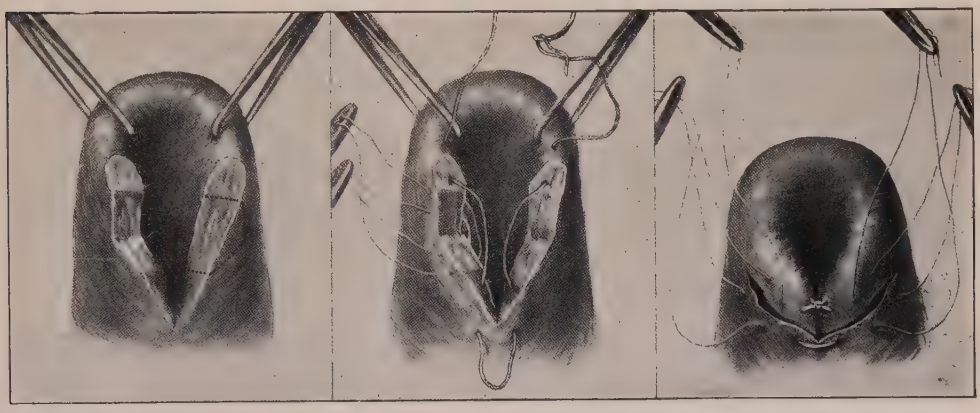


Fig. 782. Fig. 783. Fig. 784.

Fig. 782. The posterior wall of the cervix divided. The wedge of tissue has been removed from one lip and the wedge to be removed from the other lip is shown in dotted outline.

Fig. 783. The sutures for closing the wound. The central approximation suture is in place, and also the lateral hemostatic sutures on one side.

Fig. 784. The central approximation suture tied, bringing tissue into the angle of the incision to keep the internal os open.

The next problem is to bring tissue into the angle of the incision to keep the divided surfaces apart. Dudley's method of bringing the posterior portion of the external os into the angle not only keeps the divided surfaces apart but also covers the raw surfaces and furnishes a mucosa-lined opening for the shortened and straightened cervical canal. To facilitate bringing back the external os, a wedge of tissue is removed from each lip, as indicated in Fig. 782. To give complete control of the bleeding, two or three lateral sutures are introduced on one side, left loose and held by forceps, as indicated in Fig. 783. Similar sutures are introduced on the other side and left loose, not to be tied until after the central approximation suture. The field is then ready for the central approximation suture. It is passed as indicated in Fig. 783, so that when tied it

draws the tissue about the external os back into the angle of the cervical division, as shown in Fig. 784. With a needle in one end, the suture is passed at one side from the mucous surface to the raw surface, then near the angle from within outward, then across the angle, then from without inward and then out at the external os on the opposite side from raw surface to mucous surface (Fig. 783). If preferred a needle may be placed on each end of the suture, one needle being used for one side and the other needle for the other side, the suture being passed from the angle to the external os and tied there or from the external os to the angle and tied there. The main approximation suture may be reënforced by another if thought advisable. The hemostatic sutures at the sides (Fig. 784) are then tied, one or two superficial ones being added if found necessary for accurate approximation.

As to suture material, silkworm-gut has usually been used for the main suture. This must be removed later, and in the class of cases usually requiring this operation (young women) the removal is often painful and difficult. To obviate this the author has been using kangaroo tendon for the main suture, and it has worked out very well. For the other sutures, chromic catgut, forty-day, No. 2, is used.

There is some danger of projection of the edges of the flaps into the canal, narrowing the same, or even of union of raw edges across the canal. To guard against this and secure the patency of the wide canal provided by the division, the author inserts in the canal a stem pessary and leaves it there until healing is complete.

Bilateral Incision of the Cervix.

Incision of the lower part of the cervix in various directions has long been employed for relieving stenosis. Lateral incisions have recently been greatly emphasized by Pozzi as a treatment for cervical stenosis. He recommends bilateral division of the cervix (Figs. 785 and 786) and cupping out of the raw surfaces so that the edges of each wound may be brought together, as indicated in Figs. 786 and 787.

This effectively relieves stenosis in the lower part of the cervix. It is evident, however, that this lateral division cannot be carried up to the internal os. Hence the constriction at the internal os, which is the important feature in most cases, is not touched by the bilateral incision, though it may be much benefited by the preceding dilatation.

Intraperitoneal Division of Cervical Ring.

In this method, devised by Barrett, a longitudinal incision is made through the cervical ring from the posterior peritoneal surface, as indicated in Fig. 788. The abdomen has been opened and the pelvis cleared of intestines. The incision should extend deep enough to permit wide separation of the divided ends of the constricting ring, as shown in Fig. 789. The incision, both in its

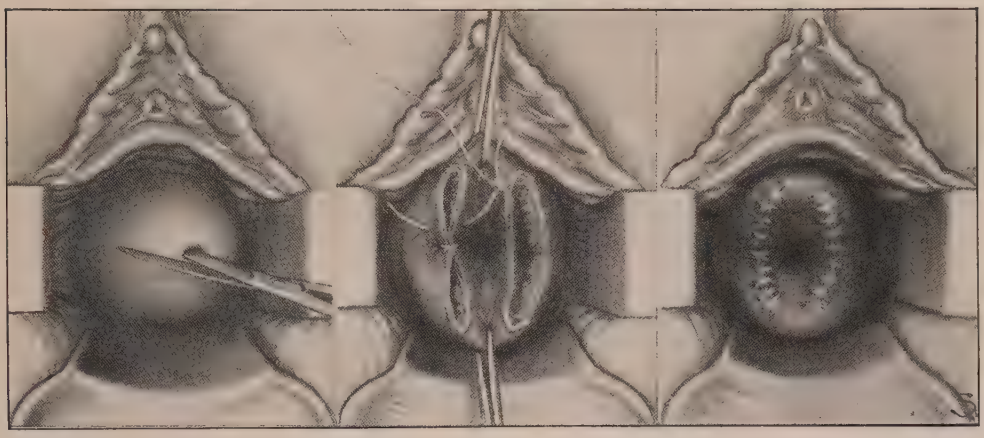


Fig. 785. Fig. 786. Fig. 787.

Figs. 785, 786 and 787. Bilateral Incision of the Cervix (Pozzi Operation).

Fig. 785. Scissors in place for incision of the cervix on the right side.

Fig. 786. Both sides divided and the raw areas cupped out and the suturing begun.

Fig. 787. The operation completed. In the opinion of the author, bilateral incision of the cervix does more harm than good. It produces eversion of the cervical mucosa with consequent irritation and inflammation. It does not reach the stenosis at the internal os, which is the main obstructive feature. The beneficial effects are due largely to the accompanying dilatation and curettage.

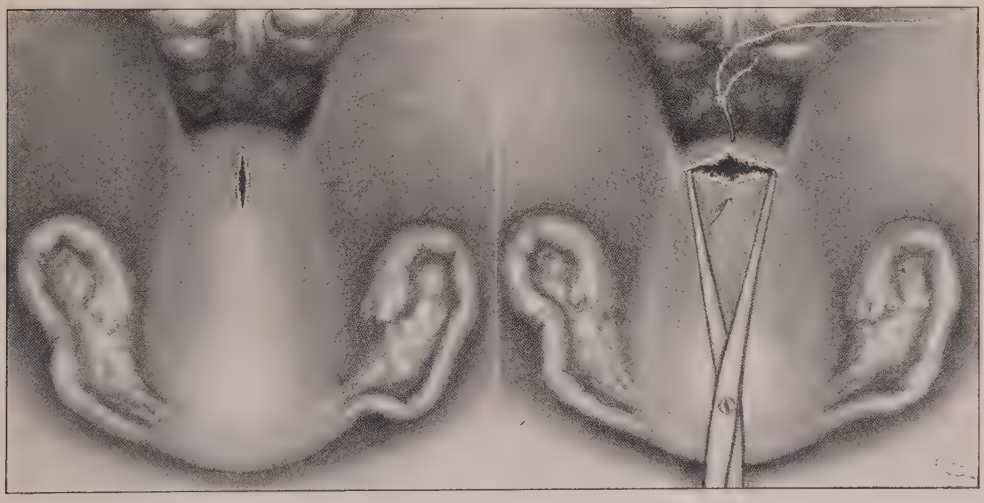


Fig. 788. Fig. 789.

Figs. 788 and 789. Intraperitoneal Division of the Cervix (Barrett Operation).

Fig. 788. The longitudinal incision from the peritoneal surface through the uterine wall at the internal os.

Fig. 789. The incision spread apart and being sutured in a way to make its length crosswise, thus widening that portion of the uterine canal.

superficial and deep portions, is then closed so that the length lies transversely, as indicated in Fig. 789.

Choice of Operative Method.

When a patient comes complaining of painful menstruation, the case is to be carefully investigated to determine the cause. The pain may be neuralgic, precipitated by the menstrual congestion and aggravated by depressed general health and increased nervous irritability. There may be imperfect development of the uterus with anteflexion of the cervix and more or less stenosis. There may be an appendicitis which becomes decidedly painful only when aggravated by the menstrual congestion. Again, there are the common genital lesions, for example, retrodisplacement of the uterus, salpingitis, oöphoritis, pelvic tuberculosis and tumors, any one of which may cause painful menstruation. Again, a lesion of some adjacent organ, aggravated by the menstrual congestion, may be the important factor in the dysmenorrhœa.

In the unmarried, a local examination is to be postponed until after a thorough trial of measures directed towards building up the general health and diminishing nervous irritability and neuralgia. It is not the author's intention to take up here the nonoperative treatment of dysmenorrhœa, but simply to emphasize the fact that operative treatment is only a part of the program to be employed in these troublesome cases. Operation must be held to its proper place in the scheme of treatment, being used with discrimination and judgment for overcoming obstruction or stimulating nutrition in the cases that cannot be otherwise suitably handled.

In the serious lesions mentioned above, the operation is directed toward correction of the serious lesion, the relief from the dysmenorrhœa being only incidental. The operations for those lesions have been considered in previous chapters.

In the cases of dysmenorrhœa presenting only imperfect development of the uterus with anteflexion of the cervix and cervical stenosis, the operative treatment is directed wholly toward relieving the dysmenorrhœa.

What operation should be employed? In the judgment of the author, the most satisfactory operative measure for the majority of such cases is through dilatation and curettage under anesthesia with the immediate fastening in of a suitable stem pessary. The pessary is to be worn for some weeks or months. The details of this treatment have already been given (Figs. 377 to 382 and 775-f). In cases in which the cervical stenosis is unusually marked and resistant, as determined by the difficulty in dilatation, the author employs posterior division of the cervix (Figs. 776 to 784) in addition to the other measures just mentioned.

Bilateral incision of the cervix (Figs. 785 to 787) apparently adds nothing of importance to thorough dilatation. Furthermore, it leads to the same disturbances that follow ordinary laceration of the cervix, namely, eversion, cystic formation and chronic inflammatory infiltration.

Intraperitoneal division of the cervix (Figs. 788 and 789) is to be considered only when the abdomen must be opened for some other lesion. Even then it is probable that the required cervical widening and uterine stimulation can be better accomplished by the employment of dilatation and curettage and the stem pessary, with posterior division of the cervix by vagina when specially indicated.

MENORRHAGIA AND METRORRHAGIA.

The operative treatment of menorrhagia depends upon the character of the disease responsible for the bleeding. Consequently the operations vary all the way from simple curettage to partial or complete hysterectomy. The technique and indications for the various operations have been detailed in the chapters dealing with the various lesions. In a considerable proportion of the cases of menorrhagia, the abnormal bleeding is dependent on systemic conditions and requires treatment accordingly.

AMENORRHŒA AND SCANTY MENSTRUATION.

Amenorrhœa and scanty menstruation are due in most cases to pregnancy or to some systemic condition. Operative treatment is, therefore, limited to those few cases in which pregnancy can be absolutely excluded and there is no anemia or obesity or other systemic condition that might diminish menstruation.

In these exceptional cases, curettage is employed to stimulate the nutrition of the uterus. The local malnutrition may be due to imperfect development or to depressive causes operative after full development. Among the latter come the cases of that rare and interesting condition designated hyperinvolution. In some of the patients who never menstruated, the amenorrhœa will be found to be due to some malformation, for example, imperforate hymen, atresia of the vagina or absence of the vagina or uterus or ovaries.

DYSPAREUNIA.

Difficulty of coitus or pain in coitus may be due to organic stenosis at the hymen or in the vagina, to spasmodic stenosis (vaginismus), to imperforate hymen or absence of vagina or atresia of vagina, to painful lesions about the external genitals or to painful lesions higher in the pelvis. Occasionally lesions not in themselves painful, such as a displaced uterus or a tumor, will encroach on the vaginal space and thus cause pain in coitus.

The treatment in each case is of course determined by the character of the lesion. In many of the cases in which operation is required, the operation is indicated by other serious symptoms resulting from the lesion, and the relief of the dyspareunia is only incidental. About the only conditions in which operation is indicated wholly for the cure of dyspareunia are absence of the vagina or stenosis or atresia of the hymen or vagina. The details of operation are given under the lesions.

STERILITY.

There are two phases of the subject of sterility which come within the scope of operative work. In certain cases operation is required to overcome sterility, while occasionally there is a case in which it is necessary to produce sterility.

Overcoming Sterility.

The operative measures for overcoming sterility vary, of course, with the character of the lesion found. If there is difficulty in coitus, that is to be remedied by appropriate treatment. If the trouble is imperfect uterine development combined with cervical stenosis and dysmenorrhœa, the measures mentioned under dysmenorrhœa are to be employed. If there is some serious lesion higher in the genital tract, interfering with the functions of the same, the lesion is to receive suitable treatment. In some cases the sterility is caused by occlusion of the Fallopian tubes. The fact of occlusion is established by the test with gas and x-ray. In such cases the chances of pregnancy may be increased by conservative operation on the tubes (Figs. 670 to 679).

Of course, before subjecting the patient to any serious operation for the correction of sterility, it must be ascertained that the cause of the sterility really lies in the patient and not in the husband.

In cases of *tubal occlusion,* the chances of overcoming the sterility by operation vary much in different cases. The individual case should be carefully studied from all angles to determine whether or not a serious operation for this purpose is really advisable. The operation only is here considered. The general consideration of sterility cases is taken up in the author's general textbook (Diseases of Women).

The tubal occlusions due to sealing of the fimbriated end, from extra-tubal or tubal inflammation leaving the remainder of the tube undamaged, offer the best chance of result from operation (Figs. 670 to 672). Occlusions involving the narrow proximal portion of the tube offer very little chance of operative reopening of the tube. Where both tubes are thus affected and neither can be opened by air inflation (Fig. 790), the only chance of overcoming the sterility lies in implanting the unoccluded portion of one or both tubes into the uterus (Figs. 791 to 797). This operation is rather extensive, and the question as to whether or not it is advisable and desired should be canvassed in each case while deciding the question of opening the abdomen. After the abdomen is opened the tubes are investigated to determine the point or points of occlusion. In investigating the condition of the proximal portion of the tube, the use of air inflation (Fig. 790) marks a decided advance. This was introduced by Curtis (Jour. A. M. A., Vol. 80, No. 6, p. 393) and has entirely replaced the former probing, which damaged the tubal lining without giving reliable information. Occasionally the air inflation overcomes slight obstructions, thus opening the occluded tube. When air inflation does not open the

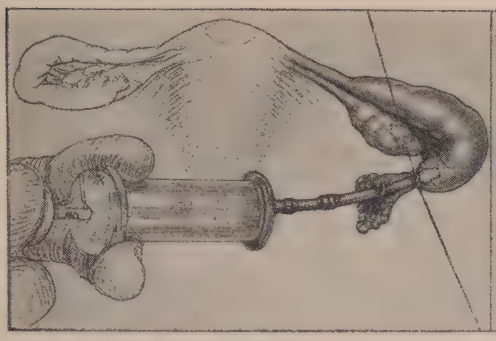


Fig. 790.

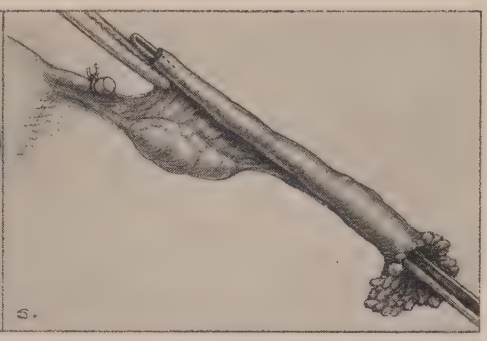


Fig. 791.

Fig. 790. Testing the left tube by air inflation. The retention of air for a satisfactory test is facilitated by using a cannula with a bulbous tip and constricting the tube firmly about it by a temporary catgut ligature back of the tip, as here indicated. Moderate pressure on the distended portion of the tube may be used to try to force air through the occluded portion.

Fig. 791. Beginning the operation for implantation of the open portion of the tube into the uterine wall. The tube has been divided just distal to the occlusion and a grooved director introduced to facilitate enlargement of the opening. This enlargement of the small opening, with flaring-out of the mucosa, is accomplished by incising the end of the tube as indicated by the short broken line.

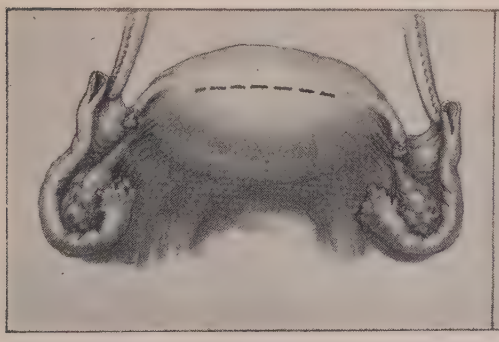


Fig. 792.

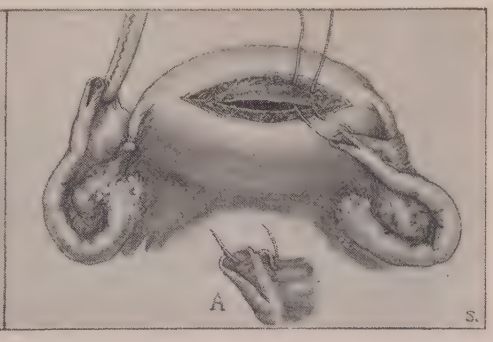


Fig. 793.

Fig. 792. The preferable area for incising the uterus is shown by the broken line. This incision should be large enough to permit accurate work in implanting the tubes so that the open ends project slightly into the uterine cavity. It should extend laterally far enough to permit the tube-end to be carried well into the uterine cavity without tension. Any tension on the pedicle of the implanted tube jeopardizes the result of the operation by tending to pull the tube-end out of the uterine cavity. While providing for the two points above mentioned, the uterine incision should be as limited as is practicable. The farther it can be kept away from the vascular tubal angle of each side the less troublesome the hemorrhage will be.

Fig. 793. The suture for drawing the end of the tube into the uterine cavity and fastening it there. This suture is of catgut and should take a good bite of the deeper portion of the uterine wall. It is passed from the cut surface into the uterine cavity, then through the pedicle of the tube as shown in the small inset, then through the adjacent portion of the tube-end and then back through the wall from the uterine cavity outward.

proximal portion of the tube, then restoration of the spermatozoa-ovum-contact-tract can be attained only by the implantation operation.

The implantation operation as employed by the author is carried out as follows:

1. Divide each occluded tube just distal to the occlusion and introduce a grooved director, as indicated in Fig. 791. Enlarge the opening at the small end of the tube by dividing it on the grooved director along the line shown in Fig. 791.

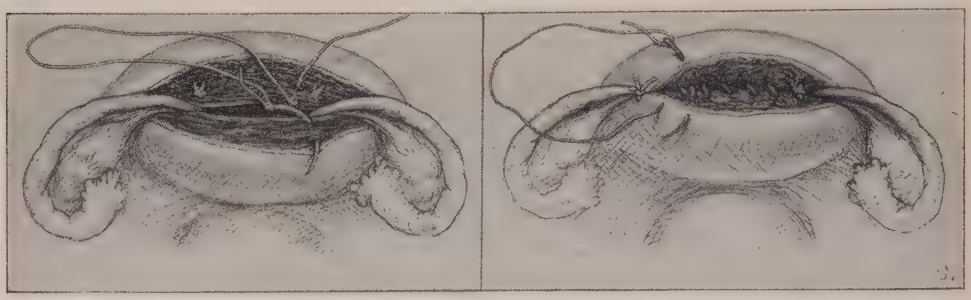


Fig. 794. Fig. 795.

Fig. 794. Both tubes drawn into the uterine cavity, and the corresponding ligatures cut short. Beginning the closure of the uterine incision.

Fig. 795. The deeper portion of the incision closed securely about the implanted tubes, and beginning a more superficial row of sutures.

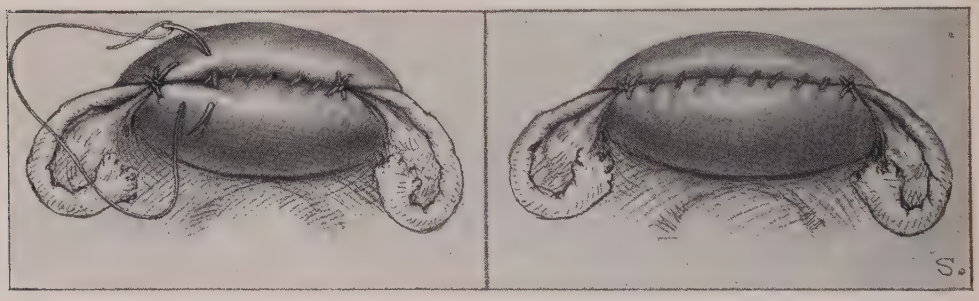


Fig. 796. Fig. 797.

Fig. 796. The peritoneum closed and beginning an infolding peritoneal suture.

Fig. 797. The operation completed.

2. Make an incision in the top of the uterus as indicated by the broken line in Fig. 792, and extend this incision into the uterine cavity (Fig. 793) and check the bleeding with forceps. Introduce a catgut suture as shown in Fig. 793 to draw the end of the tube into the uterine cavity. An extra turn of this suture immediately below the tube-end, as shown in the inset in Fig. 793, will prevent bleeding from the tube. A similar suture is passed for the other tube.

3. The sutures are then tied, drawing the tube-ends well into the uterine cavity. Hemostasis is then completed and the wound securely closed about the tubes by buried sutures, as in the closure of any deep uterine wound (Figs. 794 to 797).

Occasionally *thickening of capsule* of the ovaries will prevent ovulation and discharge of ova. The author recalls one such case, in which treatment for sterility extended over a long period. The tubes were open, and careful investigation apparently eliminated all extra-ovarian causes for the sterility. The patient was anxious to take advantage of every reasonable chance of overcoming the sterility and, as there had been also some slight appendiceal disturbance, she decided to submit to operation. At operation the capsule of each ovary was found thickened and opaque and corrugated. The greater part of each thickened capsule was removed. After recovery the patient became pregnant and was normally delivered, and is now pregnant again.

Producing Sterility.

In certain rare cases it is advisable to render the patient incapable of becoming pregnant. It might be supposed that this could be easily and certainly accomplished by ligation or division of the Fallopian tubes, but that is a mistaken idea. When the tube is ligated, the ligature may be absorbed or may cut through, the divided ends of the tube reuniting. Again, the uterine stump of the tube may form a fistulous opening, through which contact between the spermatozoa and the ovum may take place. When both tubes are removed, one or both uterine stumps may open and permit impregnation. The removal of both ovaries (supposed complete removal) is not a certain bar to impregnation, for a detached portion of ovarian tissue may be missed. This fact is attested by numerous reported cases of pregnancy following double ovariotomy.

The long-continued efforts to devise a really certain method of sterilization, without sacrifice of the uterus or ovaries, are well summarized in an excellent article by Leonard (Am. Jour. Obstet., 1913), from which the following quotation is made:

"As early as 1836 Blundell advised section of the tubes to prevent conception in cases in which delivery was sure to be difficult. According to Blietz, Froriep in 1850 attempted to obliterate the uterine orifices of the tubes by cauterization with silver nitrate, introduced by means of a uterine sound especially made for the purpose. In 1878 Kocks, with a similar instrument endeavored to accomplish the same result with the galvanocautery. Neither of these methods was destined to any extensive use.

"*Ligation of the tubes.* In 1875 Kossmann, according to Ronsse, ligated the Fallopian tubes of several chickens with heavy silk ligatures. Six weeks later these hens began to lay. At autopsy he found the ligatures heavily encrusted with lime salts and broken by the swelling of the tissues which had followed the ligation. Zweifel and Thomas were probably the first to attempt this method of sterilization in the human being. During the course of a Cæsarean section

they placed a heavy silk ligature about the middle portion of each tube with the object of preventing a second conception. Despite Kossmann's early experimental evidence of the inefficiency of this method, it gained rather wide application. Several observers, however, were soon brought to a realization of the uncertainty of its results. About 1895, Pissemsky, Sutton, and Fritsch published cases of pregnancy following ligation of both tubes with silk, while Kossmann and Arenat experienced similar failures after the use of catgut ligatures. Perhaps the most conclusive clinical evidence of the uselessness of the procedure thus far published appeared in the *Medical Press and Circular* in 1904. Taylor twice performed Cæsarean section on a rachitic dwarf, applying ligatures to both tubes on each occasion. Nevertheless, the patient again became pregnant and Martin did a third Cæsarean section and double salpingectomy together with the removal of a wedge-shaped piece of uterine cornu on each side.

"Of the twenty-three instances in the gynecological clinic of the Johns Hopkins Hospital, in which it was deemed advisable to attempt sterilization by ligation of the tubes, fourteen cases have been successfully traced. Of this number, five were over forty years of age at the time of operation. Two of the remaining nine cases became pregnant after operation. A brief account of their histories follows:

"Mrs. R., age twenty-nine, entered the hospital in June, 1908, complaining of pain in the back and feeling of weight in the lower abdomen. She was married at the age of fifteen and had since had eight children at full term and two miscarriages. Each of these eight labors was prolonged and difficult, the patient remaining in bed from four to six weeks after each delivery. On examination, the vaginal outlet was found markedly relaxed, the cervix lacerated and hypertrophied and the fundus uteri in retroposition. At operation, the cervix and perineum were repaired and the abdomen then opened. Owing to the fact that the patient had had eight difficult labors, it was thought best to fix the uterus to the anterior abdominal wall and prevent further conception by ligation of the tubes with silk. Recovery from operation was uneventful. One year later this patient after an easy labor was delivered of a full-term child.

"Mrs. Y., age thirty-seven, entered the hospital in January, 1903. She had had a very difficult labor seven years previously and had not been well since. On examination, the uterus was found in marked retroposition and the vaginal outlet considerably relaxed. The perineal laceration was repaired and the uterus suspended by the Webster method together with shortening of the uterosacral ligaments. Convalescence was satisfactory. Three years later the patient was delivered of a full-term child after a very difficult labor. She entered the hospital in January, 1908, and the perineum, which was again badly torn, was restored. The following year the patient again presented herself, complaining of dragging pain in the lower abdomen. On examination, the uterus was found in extreme retroposition. Dr. Casler's operative note during this admission is very interesting: 'The uterus has been previously suspended by the Webster method, together with shortening of the uterosacral ligaments. Examination now shows

that the round ligaments have pulled out and become gradually lengthened so that the uterus is now in extreme retroposition. The round ligaments can easily be seen coming through the broad ligaments. The patient has had a number of children (five) and as she is very anxious to be perfectly well it was thought best to ligate the tubes and fix the uterus. The tubes were doubly ligated with silk and the uterus fixed to the recti muscles in front with two silk sutures.'

"Since this operation in May, 1909, the patient has had three miscarriages—two at the second and one at the fourth month.

"*Section and resection of the tubes between two ligatures.* Impressed by the failures of simple ligation of the tube to effect sterilization with any degree of surety, Kehrer cut the tube between two catgut ligatures placed about the isthmus. A case reported by Abel in 1899 offers evidence enough of the doubtful results to be obtained by this method. The patient coming to operation for a second Cæsarean section in 1894, the tubes were doubly ligated with silk and cut between the ligatures. Three years later the patient again became pregnant. At her third operation both tubes were found to have become reunited and one was patent throughout its entire length.

"Fritsch, going further, excised a centimeter of tube between two ligatures. The observation of Cripps, Zweifel and Williamson, as well as the failures of a modification of this method described below, show conclusively that resection of the tube promises little if any better results than simple section or ligation.

"*Resection of tubes between two ligatures with burial of the uterine end.* Braun-Fernwald and Rühl, after cutting the tube between two ligatures, buried the uterine end in the broad ligament at the side of the uterus and closed it over with peritoneum. On the occasion of a second laparotomy in one of his cases, Rühl found the uterine end of the tube opening freely into the abdominal cavity. A case from the Bonn Clinic, reported by Reifferscheid, also demonstrates the uncertainty of this method. Frau F., who had had one Cæsarean section on account of a markedly contracted pelvis, presented herself again pregnant, but would consent to a second laparotomy only with the promise of sterilization. At operation, two centimeters of each tube were resected between two nonabsorbable ligatures. The uterine stumps were buried and closed over carefully with peritoneum. One year later the patient became pregnant. A third Cæsarean section being refused, she was subjected to a therapeutic abortion.

"*Section of the tubes by means of the cautery.* Kossmann, believing that by cauterization of the cut ends he could effect a thorough and permanent closure of the lumen, cut the tube between two ligatures and then applied the actual cautery to the sectioned surfaces. Fränkel, working on animals, cut the tube between two ligatures and cauterized the cut ends thoroughly for a distance of one centimeter. He found the method to be entirely inadequate, as complete atresia was not produced.

"*Bilateral salpingectomy.* As ordinarily carried out, the removal of both tubes leaving a short stump at the uterine end gives no assurance of sterilization. Many cases of pregnancy following the procedure have been reported. Schmidt, operating in a case of advanced pelvic inflammatory disease, found it necessary to remove the left ovary and both tubes. He tied the uterine ends of the tubes with silk ligatures and removed them, leaving a stump on each side 1.5 centimeters in length. Four years later the woman became pregnant. Dr. J. O. Polak, of Brooklyn, has lately reported three cases of pregnancy following salpingectomy. One of these, a young woman infected with gonorrhœa shortly after marriage, had remained sterile. At operation, both tubes were removed, leaving a ligated stump 1.5 centimeters in length at each cornu. Several years later the patient returned with severe abdominal pain and uterine hemorrhage. She had missed one menstrual period. On opening the abdomen, an interstitial pregnancy was found on the right side and excised.

"A somewhat similar case has been experienced in this clinic. S. S., a young negress, aged seventeen, first came to the hospital in September, 1906, complaining of pain in the lower abdomen. On examination a small inflammatory mass was made out on the left side. At operation the left tube and ovary were removed by Dr. Rushmore, leaving a small pedicle of tube attached to the uterine cornu. Two years later, the patient was brought to the hospital desperately ill. She had been having some abdominal pain for ten days but on the night of admission, while at stool, was suddenly taken with stabbing pains in the lower abdomen. The last menstrual period had been abnormal in that instead of the usual free flow there appeared only a slight show. On examination the lower abdomen was rigid and extremely sensitive. There was a slight bloody, vaginal discharge. Temperature 98°, pulse 130, respiration 30 and hemoglobin 35 per cent. At operation Dr. Casler found the abdomen filled with clotted blood. On the right side the tube and ovary were bound down by adhesions but the tube was patent throughout. On the left side where the tube and ovary had been previously removed was found the short stump of the uterine end of the tube, containing a ruptured gestation sac not more than two or three centimeters in diameter. 'The uterine cornu was resected on the left side, the placenta being left intact with the tubal end.' Microscopic examination later corroborated the diagnosis. Convalescence was satisfactory.

"A number of cases have been reported in which the uterine stump of a tube which had been previously removed has been resected at a second laparotomy and carefully examined as to its permeability. Ronsse secured three such specimens. In each case, the tubes had been ligated and amputated one centimeter from the cornu. On cutting serial sections, he found the tube completely obliterated in each case. According to Ries, Gottschalk has had a similar experience. On the other hand Bovée, Fränkel, Ries and Rühl have described cases in which salpingectomy was followed some time later by permeability of the tubal stump through the development of a tuboperitoneal fistula.

"Resection of the interstitial canal by removal of a wedge-shaped piece of uterine cornu. Neumann, going a step further, ligated the tubes near the uterine end and excised a wedge-shaped piece of uterine cornu, containing a part of the interstitial canal. He then brought muscle and peritoneum together with catgut sutures and covered over the small raw area remaining with the peripheral portion of the tube. During a Cæsarean section, Halban opened the uterus transversely by an incision running across the uterus from one tubal insertion to the other. Before closing the uterus, he excised the interstitial canal and a few centimeters of the tube on each side. Neumann's method, with or without the removal of the entire tube, probably offers far more assurance of an effective sterilization than any simple procedure as yet advocated. That its results are infallible, however, cannot be maintained. Küstner has reported two cases of pregnancy following Neumann's method of resection of the interstitial canal. In both cases a vaginal fixation of the uterus had been done, laparotomy being refused, and to prevent further conception, a wedge-shaped piece of uterine cornu was removed on each side together with a small portion of the tube. Both women became pregnant a few years later.

"One of the cases reported by Polak two years ago is particularly interesting in this connection. At operation, in May, 1908, a dermoid cyst of the right ovary was removed together with the right tube and a wedge-shaped piece of uterine cornu. In July and August following the menstrual periods were missed. In September, the patient returned with evident signs of internal hemorrhage. The abdomen was opened and a ruptured interstitial pregnancy in the right cornu found. This case, as well as the one from this clinic reported above, are excellent demonstrations of the remarkable manner in which the ovum may sometimes transmigrate from one side of the pelvis to the other.

"Animal experimentation. A large number of observers, notably Fränkel, Ronsse, Kehrer, Landau, Josephon, Ratschinsky, Woskressensky, McIlroy, and many others, have attempted to solve the interesting problem of obtaining a simple but effectual method of sterilization by experimental work on animals. Fränkel and Ronsse have offered the most thorough works on the subject thus far published, but unfortunately these authors have obtained directly contradictory results. The fact that both of these observers chose the same animal for their work, the rabbit, only adds to the difficulty of explaining their differences. Fränkel, whose work preceded that of Ronsse by a few years, tested out various methods of obliterating the lumen of the tube and uterine cornu. In twenty-six rabbits he completed thirty-three experiments on the tubes and twenty-nine experiments on the uterine cornu. Obliteration of the lumen was attempted by (1) single and double ligatures of rubber, silk, and catgut, (2) simple section, (3) section between two ligatures, (4) resection between two ligatures, (5) resection alone, and (6) resection with cauterization of the cut ends. The tissues were removed at varying intervals and cut in serial sections. Of the thirty-three attempts to obliterate the tube only two were successful and of the twenty-nine experiments on the uterine cornu not a single instance of complete obliteration

was found. He concluded that total extirpation of the tube including a part of the uterine cornu and interstitial canal was the only method to be recommended as offering any certainty in its results.

"Ronsse, working along the same line, subjected his rabbits to similar procedures: (1) On the uterine cornu, he tried simple ligature with silk and catgut, simple section, section between two ligatures and resection between two ligatures.

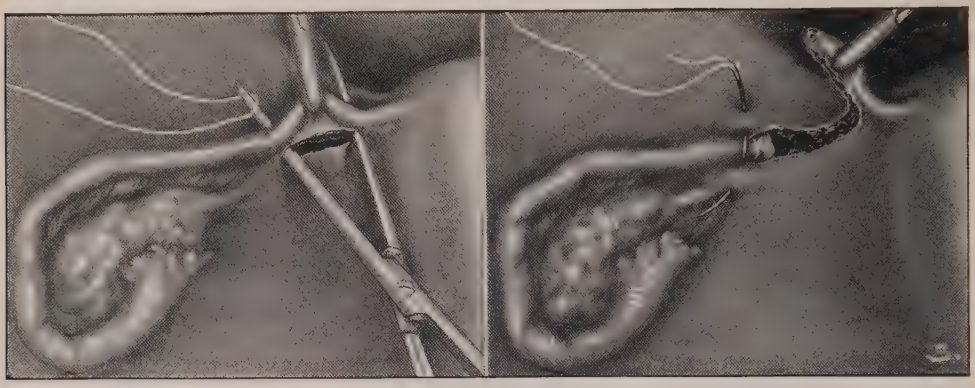


Fig. 798. Fig. 799.

Fig. 798. Operation for Sterilization. The tube has been picked up and a forceps pushed through the broad ligament beneath it and opened widely, thus isolating that portion of the tube for a considerable distance. A ligature is ready to be caught in the forceps and drawn through.

Fig. 799. The tube has been ligated and divided and the ligated end is being buried between the layers of the broad ligament.

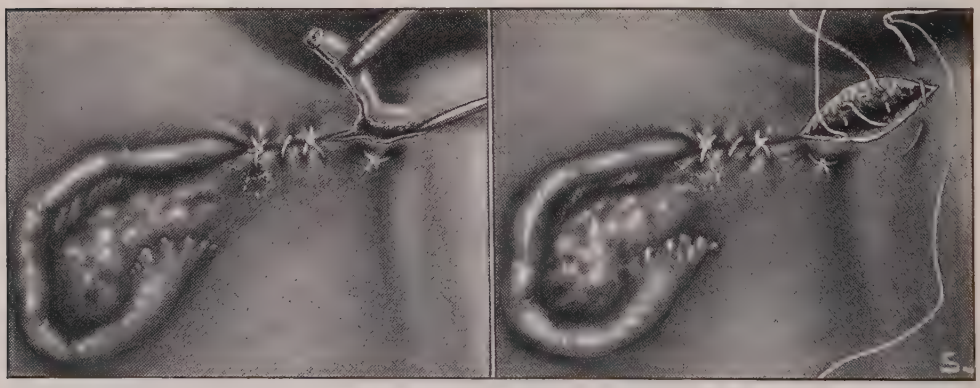


Fig. 800. Fig. 801.

Fig. 800. The ligated end of the tube has been buried. Its location between the layers of the broad ligament is indicated by the dotted outline. The vessels to the proximal end of the tube have been ligated and the stump of the tube is being excised, the excision to extend into the uterine wall.

Fig. 801. Closing the wedge-shaped wound in the horn of the uterus. The deep portion is to be closed by a buried suture and then the peritoneum is to be accurately approximated by a superficial suture, as here indicated.

With perfect regularity, a complete closure of the lumen and hydrometra resulted. (2) On the tubes, he tried single ligatures and section without ligature. He says: 'Not only does ligature provoke complete obstruction of the cornu and the tube but simple section is followed by the same result.' In a few cases the tube had apparently reunited after resection of a small piece but microscopic examination demonstrated the atresia to be complete. Fränkel and Ronsse each have their supporters and much corroborative work. A satisfactory explanation of their contradictory conclusions must be left to future workers. It must be admitted, however, that the clinic has offered Fränkel far more corroboration than Ronsse.

"Until more satisfactory methods have been devised, it would appear that extirpation of the tubes, together with excision of a wedge of uterine cornu, had best be adopted as the only simple procedure offering reasonable assurance of preventing subsequent conception."

If the ovary is to be preserved, it is well to preserve the greater portion of the tube, also, if it is normal. The preservation of the outer portion of the tube protects the blood supply of the ovary and does not in the least jeopardize the sterility.

The following simple method of sterilization has been used by the author with satisfaction and it seems to answer every necessary requirement. It may be carried out by the abdominal or by the vaginal route, in the following steps (the illustrations are from the abdominal method):

1. The tube is seized with a forceps about half an inch (1 cm.) from the uterus. Another forceps is thrust through the broad ligament just under the tube and opened widely, as indicated in Fig. 798. A ligature is then placed in the forceps (Fig. 798) and the forceps closed and withdrawn. The ligature is tied firmly about the tube, distal to the forceps which grasps the tube. The ligature is cut short and the tube is divided between ligature and the forceps.

2. The ligated end of the tube is buried between the layers of the broad ligament by closing the peritoneum over it, as indicated in Figs. 799 and 800.

3. The proximal portion of the tube is excised into the uterus, as indicated in Figs. 800 and 801. The principal bleeding is checked by a ligature at the uterine horn, and then the wound is closed by deep and superficial sutures as shown in Fig. 801. The hemostasis and wound closure may be accomplished by a single thread or by separate sutures, as shown in the illustration.

4. The round ligament of that side is brought over the wound-area and fastened back of the uterus, as shown in Figs. 36 and 37. This further seals the area between the uterine and peritoneal cavities and also serves to keep the uterus well forward.

CHAPTER XV.

ABDOMINAL SECTION.

In the treatment of certain gynecologic affections it is necessary to invade the peritoneal cavity. This invasion of the great peritoneal sac in the center of the body necessarily carries with it considerable risk to the patient. In the preantiseptic days the mortality was great—so great that the operation was but rarely resorted to. By modern antiseptic and aseptic methods, however, the mortality has been reduced to a very small per cent. But, though the mortality of the operation is small, we must not forget that there is a mortality due directly to the operation.

The danger varies much in different cases, depending on the particular form of disease present and on the condition of the patient at the time of operation—but there is some danger in every case. It is well to call particular attention to this because some physicians seem prone to overlook, or at least fail to give proper weight to, the fact that occasionally a patient, with everything apparently favorable, will die; and no one can promise any patient absolutely that she will survive. One may say, in a favorable case, that the risk is very slight and that in all probability the patient will go through the operation and convalescence without trouble. But though the risk is slight, it is nevertheless a risk, and the patient or her friends must so understand it. Such necessary explanation to the patient or her relatives is made with much better grace before operation than afterward.

The peritoneal cavity may be readily entered in two ways—by incision through the anterior abdominal wall (abdominal section) or by incision through the vaginal wall (vaginal section). Abdominal section is here considered. This is known also as "celiotomy" and as "laparotomy" and as "suprapubic section." These terms all refer simply to the incision through the abdominal wall into the peritoneal cavity and not to the subsequent operative manipulations carried on within the cavity.

The incision may be located at any part of the wall, in the median line or laterally. The direction of the incision may be longitudinal or transverse or oblique, or a combination of these directions.

There is usually some additional operative procedure carried out after the peritoneal cavity is opened, and this additional procedure frequently gives the name to the whole operation—for example, ovariotomy (abdominal section with removal of an ovary or an ovarian tumor), myomectomy (abdominal section with removal of a myoma of the uterus), abdominal hysterectomy (abdominal section with removal of the uterus).

INDICATIONS.

The most common indications for abdominal section in gynecologic work are as follows:

1. Ovarian tumors.
2. Broad-ligament tumors.
3. Uterine myomata with serious symptoms not yielding to minor measures. The abdominal operations in these cases are myomectomy, supravaginal hysterectomy and total abdominal hysterectomy.
4. Cancer of the uterus (total abdominal hysterectomy).
5. Extrauterine pregnancy.
6. Acute pelvic inflammation which spreads in spite of other measures and threatens life.
7. Chronic pelvic inflammation with a collection of pus high in the pelvis, as in pyosalpinx.
8. Chronic pelvic inflammation with a large amount of exudate and persistent troublesome symptoms.
9. Chronic pelvic inflammation without decided exudate, if everything else fails to relieve the pelvic distress.
10. Pelvic tuberculosis, if other measures fail to produce decided improvement.
11. Adherent retrodisplacement of the uterus, causing troublesome symptoms and not yielding to less dangerous measures.
12. Obscure or doubtful pelvic disease which, in spite of other measures, threatens the patient with death or with chronic invalidism (exploratory abdominal section).

CONTRAINDICATIONS.

The more common contraindications to abdominal section are:

1. Marked nephritis, especially chronic interstitial nephritis.
2. Diabetes mellitus.
3. Inoperable cancer or advanced pulmonary tuberculosis.
4. Any chronic disease, general or local, causing marked weakness and lessening the patient's resistance.
5. Acute disease that may be aggravated by the operation.
6. Dermatitis within the operative field.

All these contraindications are of course only relative. There may arise circumstances demanding the operation at once in spite of contraindications, that is, circumstances in which the danger of delay would be greater than the danger of immediate operation. But when the case is not one of extreme urgency, the operation should be postponed until the complicating disease can be corrected and the patient placed in better condition.

Pregnancy increases the danger of abdominal section very decidedly, but it is not often a contraindication for the reason that the disease requiring operation (for example, a large tumor or an abscess) precludes the full development of the fetus or makes the dangers from advancing pregnancy greater than those from immediate operation.

DANGERS.

The immediate dangers of an abdominal section are three:

1. Failure of the vital forces to stand the shock of the operation. This shock is due principally to (a) the loss of blood, (b) the handling of intraperitoneal structures, and (c) the anesthesia.

2. Failure of the vital organs (heart, lungs, kidneys and gastro-intestinal tract) to perform the extra work thrown on them in the days following operation.

3. The development of infection, causing general peritonitis or localized suppuration.

PREPARATIONS.

In order to reduce to a minimum the dangers of the operation, careful preparation is required.

The operation should, when possible, be carried out in the clean, well-arranged operating room of a hospital, even though the patient has to be moved a considerable distance to obtain the requisite hospital facilities. Abdominal section is too serious an operation to be undertaken in the home if the patient's condition will permit her removal to a hospital.

When the operation must be performed at the home of the patient, the room should be made as clean and free from dust as possible by the following steps:

a. Remove the bric-a-brac and superfluous furniture and sweep the walls and ceiling and floor thoroughly.

b. The carpet may be removed, leaving the bare floor, or after sweeping the carpet well, it may be covered completely with oilcloth well tacked down.

c. The woodwork should then be washed with soap and water, and also the floor or oilcloth.

The further preparations for the operation will be given under the following subheads:

Preparation of the patient.
Preparation of instruments and dressings.
Preparation of operator and assistants.
Special points in anesthesia.

Preparation of the Patient.

The patient, having been subjected to a careful general examination, including urine analysis, to exclude contraindications, is sent to the hospital one or two days before operation, that the proper preparation may be carried out. Of

course, there are cases of rapidly spreading pelvic inflammation, or of intra-abdominal hemorrhage or injury, in which the abdomen must be opened at the earliest possible moment. In such a case there is no time for preliminary preparation. Careful immediate sterilization is carried out and the abdomen is then opened. But when the case is not an emergency one, the preliminary preparation should be made. It gives the patient a decidedly better chance of complete and uninterrupted recovery.

The purposes of this preliminary preparation are:

a. To tone up the patient's nervous system so that she will be better able to stand the operation.
b. To see that the kidneys are in good working order, and to prepare the urine for possible catheterization.
c. To nourish the patient so as to limit intestinal decomposition, and to empty the intestine tract well just before operation.
d. To prepare a sterile field for the operative work.

These desired results are secured by a program ordinarily about as follows, supposing the time for operation to be an early morning hour:

1. Nervous system and general measures. If the patient is weak, it is well to give strychnia sulphate $\frac{1}{40}$ grain by mouth every six to eight hours, depending upon the amount of stimulation needed. If the patient's stomach is much disturbed, this may be given hypodermatically. Such other medicines should be given as are indicated by pain or nausea or cough or other symptoms. It is important that the patient secure her rest at night and it is well to order sodium bromide, 20 grains, to be given if sleepless. If there is a vaginal discharge, an antiseptic douche is to be given once or twice daily.

A preanesthetic sedative quiets the nervous system, renders the anesthetic less disagreeable to the patient and reduces the amount of anesthetic required. For this purpose, morphine sulphate $\frac{1}{6}$ grain and atropine sulphate $\frac{1}{150}$ grain, given about forty-five minutes before operation, has been found reliable after thorough testing. For some time the author has been using hyoscine-morphia analgesia as a preanesthetic sedative, and with much satisfaction. Morphia sulphate $\frac{1}{4}$ gr. and hyoscine hydrobromide about $\frac{1}{130}$ gr. (one ampule—B&W) are given hypodermatically one hour and forty-five minutes before the operation. The hyoscine (but not the morphia) is repeated forty-five minutes later, i.e., one hour before operation. The patient is then catheterized and afterward kept quiet with the room darkened until taken to the operating room. The hyoscine-morphia analgesia eliminates the preoperation anxiety, which is so troublesome to some patients and more or less troublesome to all. Also, the patients take the anesthetic more quietly and require less for operations of the same length. Again, there is less postoperative vomiting and distress. The dose of the drugs should of course be adjusted to the size and condition of the patient, being somewhat less than the above for small or weak individuals.

2. Kidneys and urine.—Determine whether the kidneys are doing their work well. Make the regular analysis of the urine, and, when indicated, the special examinations. As the patient may have to be catheterized after operation, it is well to give some urinary antiseptic for a day or two before. Have the patient take water rather freely.

Formerly the author took particular pains to thoroughly saturate the patient with water before operation, for the purpose of aiding the kidney-action after operation and diminishing the thirst, but he has discontinued the practice as a routine because he found certain drawbacks—the principal one being that it interfered with spontaneous urination after operation. The avoidance of catheterization is much to be desired and can usually be accomplished, provided the bladder does not fill until the patient has well recovered from the anesthesia. In the water-saturated patients, the urine is secreted so rapidly that frequently the bladder becomes distended before the reflexes are sufficiently established to bring about spontaneous urination. In certain cases, however, where the kidneys are defective, the author still employs saturation.

3. Diet and laxatives. Light diet is to be given up to and including noon of the day before operation, then liquids only, but with water in abundance. After midnight, just preceding the operation, nothing is to be given by mouth but water—the water may be continued up to within an hour of the operation.

An enema is to be given the night before and again the next morning. In cases of marked habitual constipation and cases where the bowels are not to be moved for some time after the operation, such as in repair of complete laceration, it is well to give a moderate dose of castor oil at 3 P.M., the day before operation.

The idea is to have the intestinal tract in as nearly a normal condition as possible, with simply a good clearing out of the lower bowel just before the operation. Experience has shown that this simple method of preparation brings the patient to the operating table in better condition and causes less disturbance after the operation than the prolonged dieting and purging formerly employed. The latter upset the functional routine of the intestine, disturbed the normal peristalsis, increased the intestinal irritation and putrefaction, and reduced the patient's strength. Since omitting the cathartic, except in special cases, there has been a marked decrease in post-operative nausea and vomiting and distention.

When there are complications that may necessitate resection of the intestine or opening of the stomach, then, of course, the usual preoperative measures for approximate sterilization of the upper intestinal tract should be employed.

4. Sterilization of the field. In the preparation of the operative field, as in the intestinal preparation, the trend of practice has been toward simplicity. It has been found that some of the measures formerly employed served to irritate the skin and increased rather than diminished the chance of inflammation. This was true particularly of the strong antiseptics applied for long

periods preceding operation. Instead of the extensive soap poultice and the prolonged antiseptic pack, the following method, with minor modifications, is now employed generally:

The afternoon before operation the abdomen is lathered and shaved. It is then scrubbed with green soap and, after soap is removed, with sterile water, and then the surface is washed with alcohol. The cleansed surface is covered with a sterile towel or sterile cotton, held in place with a binder.

After the patient is anesthetized, the dressing is removed and the surface resterilized. For this purpose iodine or picric acid solution may be used. If the former, the surface is painted with a 3½ per cent solution of iodine in alcohol. To provide the solution, the tincture of iodine may be diluted with alcohol to one-half strength or, if preferred, iodine crystals may be dissolved in 95 per cent alcohol. The application should be made from the area of incision outward, so that this area may not be contaminated by material brought from the periphery. After the first coating of iodine has dried another coating is applied along the line of incision, and the iodine over the remaining part of the abdomen is removed with alcohol. The sterile towels and sheets are then arranged about the field and the incision is made. After the operation all the remaining iodine should be removed with alcohol before the patient leaves the table and before any adhesive strips are applied. Some patients have an idiosyncrasy to iodine and any of it left on the skin causes a severe dermatitis, particularly under the adhesive strips. If spinal anesthesia is to be used, the lumbar region is prepared in the same way.

For some time the author has been using picric acid instead of iodine for preoperation sterilization in all localities, and much prefers it. A 5 per cent solution of picric acid in 95 per cent alcohol is painted over the surface, with a second coating along the line of incision. It eliminates the skin irritation and blistering of iodine, does not have to be removed, and seems to give a deeper and longer-lasting skin sterilization. Several articles have appeared detailing facts and experiments concerning it. Hewitt has given a good presentation (Am. Jour. Obstet. and Gynec., April, 1921).

After anesthesia all preparations should be carried out *rapidly*, that the time under anesthesia be not unduly lengthened. Every minute's prolongation of the anesthesia is detrimental to the patient. This is a very important point, and it should be repeatedly impressed on assistant physicians and nurses. Every preparation should be carried out as rapidly as accuracy will permit. The saving of seconds and minutes under anesthesia is much facilitated by good teamwork among those engaged in the preparation of patients. The repeated emphasis of this point by the chief assistant physician and by the nurse supervisors will create an *esprit de corps* that makes for rapid, accurate work—to the benefit of every patient handled and to the added satisfaction of all concerned.

The surgeon also must keep this point in mind in the actual operative work. It is so easy to waste time inspecting interesting tissues or explaining

various steps of technique. An abdominal operation is a serious matter, and at some stage in nearly every such operation conditions are encountered that require careful study and slow dissection—hence the importance of moving rapidly in the other stages of the work.

Preparation of Sponges, Instruments, Etc.

The instruments, gloves, gowns, sponges, sutures, etc., are usually prepared as follows:

1. **Sponges** and pads and dressings are sterilized in the steam sterilizer. The gowns for operator and assistants and the sterile cloths and sheets, and instruments, trays and basins are put through the same process.

In emergency work in the country where no steam sterilizer is available, an ordinary wash boiler may be used. The various articles to be sterilized

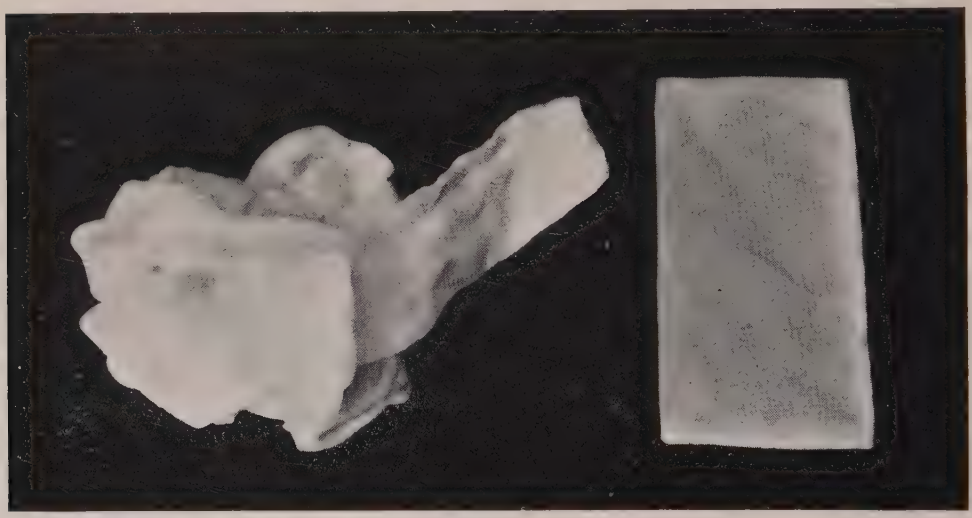


Fig. 802. The gauze strip, folded, and the muslin bag. The gauze strip is 10 yards long and 18 inches wide, and when folded longitudinally to six thicknesses gives a folded strip 3 inches wide. The muslin bag is 5 inches wide and 10 inches deep, and is sewed with French seams so that there is no chance for a raveling to be pulled out with the gauze.

(gauze, sponges, towels, sheets, gowns, etc.) are wrapped in small packages, each package being wrapped in two thicknesses of cloth, and are then boiled for thirty minutes. In order to dry the gowns somewhat, they may be removed from the boiler, wrung as dry as possible with clean hands, being careful not to disturb the double covering, and then dried in an oven.

Continuous Gauze-strip Sponges. In regard to the form of sponges to be used, the author strongly recommends the continuous gauze-strip sponges for abdominal work. The numerous detached sponges ordinarily used are dangerous and have led to many serious results. A sponge left in the peritoneal cavity following an operation constitutes one of the most deplorable

accidents of abdominal surgery. The continued occurrence of this fatal accident and the failure of the preventive methods in general use, constitute sufficient reason for emphasizing the continuous gauze-strip sponges, which the author has used with much satisfaction for many years. This method gives entire security, and at the same time is simple and inexpensive.

Fig. 803. Packing the gauze strip into the bag: The end of the strip is stitched to the bottom of the bag, as shown by the black stitch in the illustration, and the strip is then packed into the bag as here indicated. Packed in this, it may be conveniently pulled out a little at a time as needed for sponging.

The object of the method is to make the removal of all sponges automatic, and therefore independent of sponge counting and other uncertain procedures. The essential feature of this method is the substitution of a long gauze strip for the ordinary detached sponges, the greater part of the strip being always outside the abdominal cavity. The strip is 10 yards long. Two strips are made by dividing the yard-width of gauze in the center and folding each

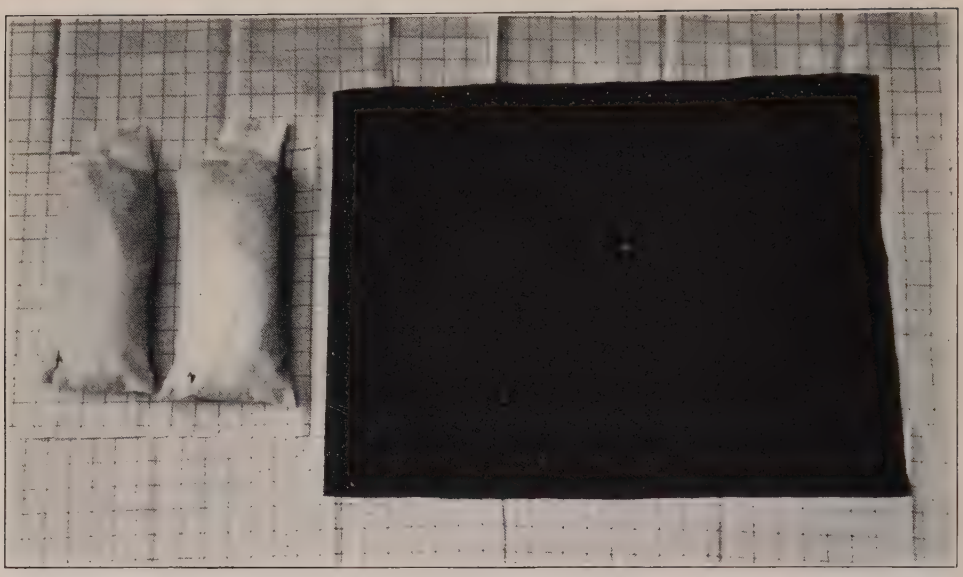


Fig. 804. Set of strip sponges and rubber sheeting for abdominal operation. The arrangements for abdominal packing and sponging thus become very simple; the intestines are packed away from the field with the rubber sheeting, and the sponging is done with the continuous strip sponge, which automatically removes all danger of a sponge being left. The piece of rubber sheeting measures 18 by 36 inches and is of very heavy pure-gum rubber dam, No. 20 gauge. The lighter weight rubber dam was found not satisfactory for this work.

Fig. 805. Use of the gauze-strip sponge. Ready to sponge with the end of the strip.

half longitudinally to six thicknesses. Each strip is therefore 10 yards long, about 3 inches wide, and has six thicknesses of gauze. For protection and convenience in handling, the strip is packed into a small muslin bag, 5 inches wide and 10 inches deep (Fig. 802). The end of the strip is stitched to the bottom of the bag, and the strip is then packed into the bag in such a way that it may be pulled out a little at a time, as needed (Fig. 803). The filled bags are sterilized and are then ready for use (Fig. 804). At operation, the bottom of the bag is clamped or pinned to the abdominal sheet, and the gauze strip is pulled out a little at a time as needed for sponging (Figs. 805 to 808).

Fig. 806. Use of the gauze-strip sponge: the soiled portions gravitate out of the field.

For packing back the intestines, sheet rubber is used. Experimentation with different sizes and weights resulted in the adoption for routine use of a piece 24 × 36 inches of very heavy pure gum rubber sheeting, No. 20 gauge. This may be folded as desired (Fig. 804).

The arrangements for abdominal packing and sponging thus become very simple (Fig. 804). The intestines are packed away from the field with the rubber sheeting, and the sponging is done with the continuous strip sponge, which automatically removes all danger of a sponge being left (Fig. 809). The gauze-strip sponges and bags are made with much less trouble than the

numerous detached gauze pads and sponges of various sizes in general use. Nurses welcome the method, because it simplifies the preparations for abdominal operation and also eliminates the trying responsibility of sponge counting at the close of the operation. The methods of preparation and use are shown in Figs. 802 to 809.

This important subject of safety in abdominal sponging is considered in detail further along under the special heading, "Foreign Bodies Left in the Abdomen."

2. **Instruments** are boiled ten to fifteen minutes. They must be entirely immersed in the water and the water must boil (not simply simmer) for at least

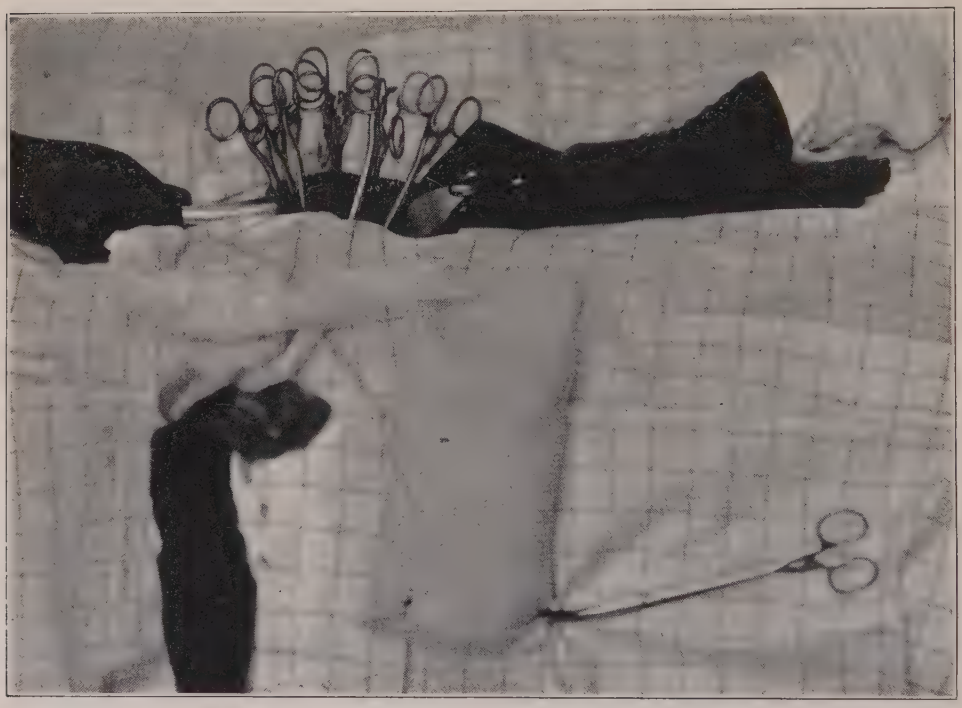


Fig. 807. Use of the gauze-strip sponge. An accumulation of forceps in the wound.

ten minutes. A one per cent solution of sodium carbonate (washing soda) is preferable to plain water, as it tends to prevent rusting of instruments. There are a few exceptions to the boiling rule. The knives and scissors are usually soaked in 95 per cent carbolic acid for ten minutes or in 10 per cent carbolic solution for half an hour, as boiling tends to dull them. However, if in a hurry, they may be boiled with the other instruments, in which case the cutting edge should be wrapped in cotton.

As to **suture** and **ligature** materials, silk and silkworm-gut are boiled along with the instruments. Reliable catgut may be purchased, sterilized and ready for use.

The **rubber gloves** and the rubber sheeting may be wrapped in a towel and boiled along with the instruments. After boiling they are placed in 1-5000 bichloride solution. They are much easier put on when partly filled with solution. The weak bichloride solution is used, so as to kill any bacteria that may work to the surface of the skin of the hands during the course of the operation. When the gloves are put on in simply sterile water, the warm mixture of sterile water and macerated epithelium, which forms in the glove during the course of a long operation, becomes a culture medium for the bac-

Fig. 808. Use of the gauze-strip sponge. Forceps grouped and covered by assistant's hands to avoid entangling of sponge or ligatures about handles.

teria which work to the surface from the deeper layers of the skin, and which may be liberated in the peritoneal cavity by a puncture of the glove.

Where the dry method of glove preparation is used, it is well to soak the hands in bichloride solution before drying them to put on the gloves.

Instruments Required. All instruments used about an opening into the abdomen should be *long,* to guard against the accident of leaving an instrument in the cavity. This accident has happened several times, and with serious consequences to the patient and to the physician. Efficient prophylaxis

requires the exclusion of all short and unattached instruments from the vicinity of the wound.

The following set of instruments includes those commonly employed in abdominal section for gynecologic disease. This may be styled the "regular set" and it is sufficient for all the usual operative procedures. Later will be mentioned a number of special instruments, required in special conditions.

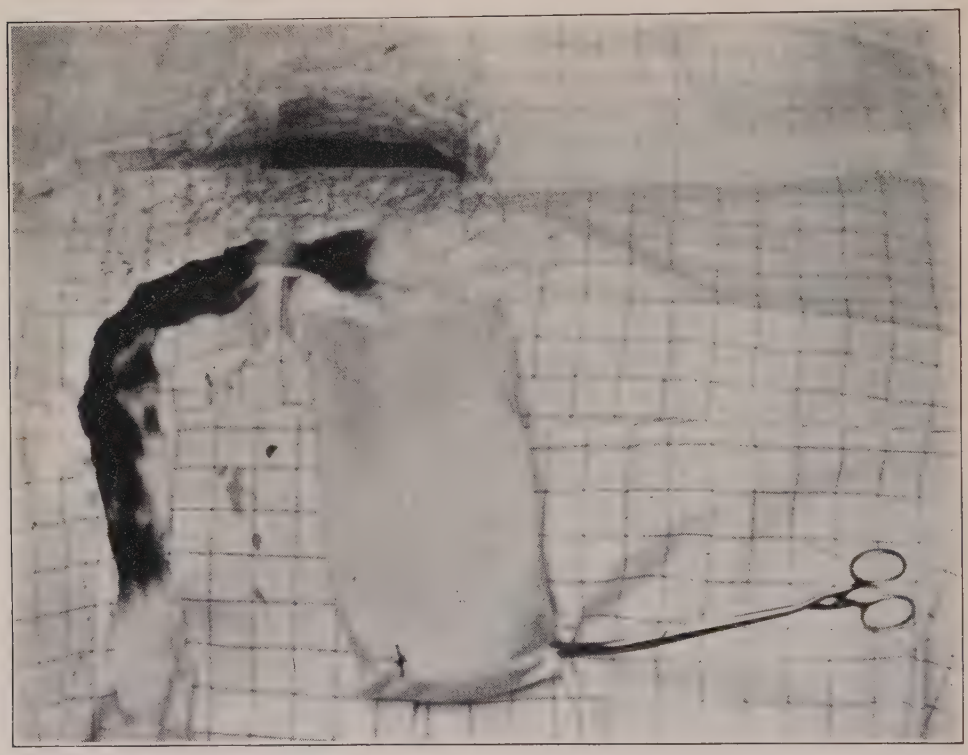


Fig. 809. Use of the gauze-strip sponge. Operation finished; no counting of sponges and no anxiety as to one being left.

Regular Set.

2 Scalpels.
1 Large Dissecting Scissors.
1 Straight Uterine Scissors, sharp-pointed.
1 Curved Uterine Scissors, blunt-pointed.
2 Long Dissecting Forceps, with sharp teeth.
1 Long Dissecting Forceps, with blunt teeth or rubber covering.
2 Flat Spatula-retractors (narrow and wide).
2 Large Retractors, double end.
1 Angled Retractor, medium length.
1 Angled Retractor, long.

18 Curved Clamps.
12 Straight Clamps, toothed.
3 Needle Holders.
1 Single Tenaculum-forceps.
2 Double Tenaculum-forceps.
1 Large Tenaculum-forceps.
1 Long Probe.
1 Pedicle-needle.
1 Small Trocar.
Set of Needles.
Set of Ligatures and Sutures.
Hard Rubber or Soft Rubber Drainage Tubing.
Heavy Rubber Sheeting, No. 20 gauge, piece 24 × 36 inches.
Rubber Gloves, 6 pairs.

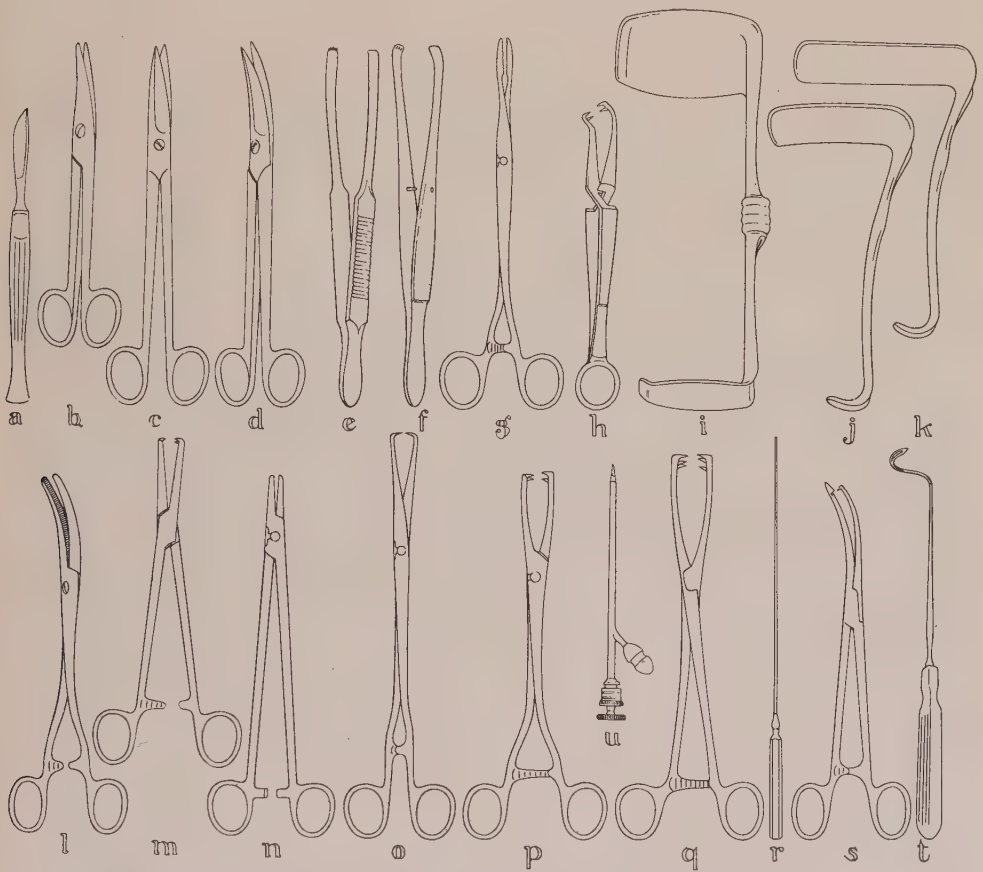


Fig. 810. Regular Set of Instruments for Abdominal Operation for Gynecologic Disease: *a*, scalpel (two); *b*, large dissecting scissors (one); *c*, straight uterine scissors sharp-pointed (one); *d*, curved uterine scissors, blunt-pointed (one); *e*, long dissecting forceps with sharp teeth (two); *f*, long dissecting forceps with blunt teeth or rubber covering, (one); *g*, long artery forceps if desired, (six); *h*, peritoneum-towel forceps if desired, (six); *i*, large double-end retractor (one); *j*, angled retractor, medium length; *k*, angled retractor, very long; *l*, curved clamp (eighteen); *m*, straight clamp, toothed (twelve); *n*, needle holder (three); *o*, single tenaculum-forceps (one); *p*, double tenaculum-forceps (two); *q*, heavy tenaculum-forceps (one); *r*, long probe (one); *s*, puncturing tenaculum-forceps if desired, (one); *t*, long pedicle-needle (one); *u*, small trocar (one).

The instruments are shown in Fig. 810. The needles and suture materials are shown in Fig. 811. The author finds it very advantageous to have all the

sutures and ligatures prepared as indicated in Fig. 812, before beginning the operation. This expedites the work by having the articles always ready when needed. The preferable forms of drainage tubes are shown in Fig. 813. Soft rubber tubing may be used for drainage, if preferred or if the hard rubber tube is not available.

Additional Instruments.

Certain additional instruments are needed in special cases.

Abdominal Spreader (Fig. 814). The spreader is a self-retaining retractor which holds the incision widely open. It is particularly useful in cases requiring deep pelvic dissection, such as the radical abdominal operation for cancer of the cervix uteri. Also, when the operator is short of assistants, the spreader may be used to advantage.

In ordinary pelvic work the spreader is not necessary, and its use delays rather than expedites the work.

Large Cyst Trocar (Fig. 814). A cyst trocar was an essential instrument in the removal of an ovarian tumor by the method formerly employed. But

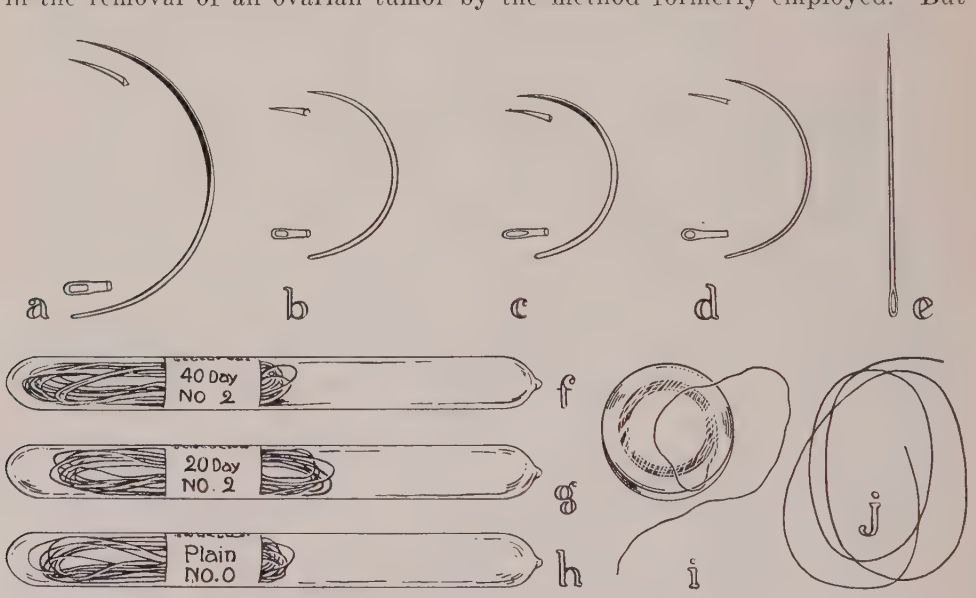


Fig. 811. Needles and Suture Material for Abdominal Operation for Gynecologic Disease: *a*, large full-curved surgical needle with cutting point, for use without needle holder, (eight); *b*, small strong full-curved needle with round point (non-cutting), for ligating pedicles and general tissue suturing in the pelvis, (six); *c*, strong full-curved cervix needle with cutting point, for suturing the firm tissue of the cervix uteri, (usually not needed) (two); *d*, slender full-curved needle with round point, for suturing the intestine and for conservative work on the ovaries or tubes or bladder, (four); *e*, slender straight needle with large eye and round point, for intestinal suturing, (two); *f*, 40-day catgut, No. 2, for suturing the aponeurosis of the abdominal wall and for suturing the round ligament or other structures used in fastening the uterus forward, (four tubes); *g*, 20-day catgut, No. 2, for ligating pedicles and general suture work in the pelvis, (six tubes); *h*, plain catgut, No. 0, for suturing the skin and for conservative work on the ovaries or tubes, (two tubes); *i*, fine linen or silk, for excision of the appendix and other work as desired, (six feet); *j*, silkworm-gut, for tension sutures in the abdominal wall, (twelve strands).

since the recognition of the greater safety, in most cases, of removing the cyst intact, the trocar is seldom used. When the cyst is tapped there is usually some leakage of the fluid. Though this ordinarily causes no trouble, there are exceptional cases in which it results seriously. In some cases the fluid is infected and in other cases it contains tumor elements which favor recurrence. Therefore it is safer, as a rule, to avoid tapping the cyst. Occasionally, however, tapping through a small incision under local anesthesia is advisable—for example, where the tumor is very large and causes so much pulmonary restriction and circulatory disturbance that no general anesthetic is safe. Again, in rare cases a smaller cyst

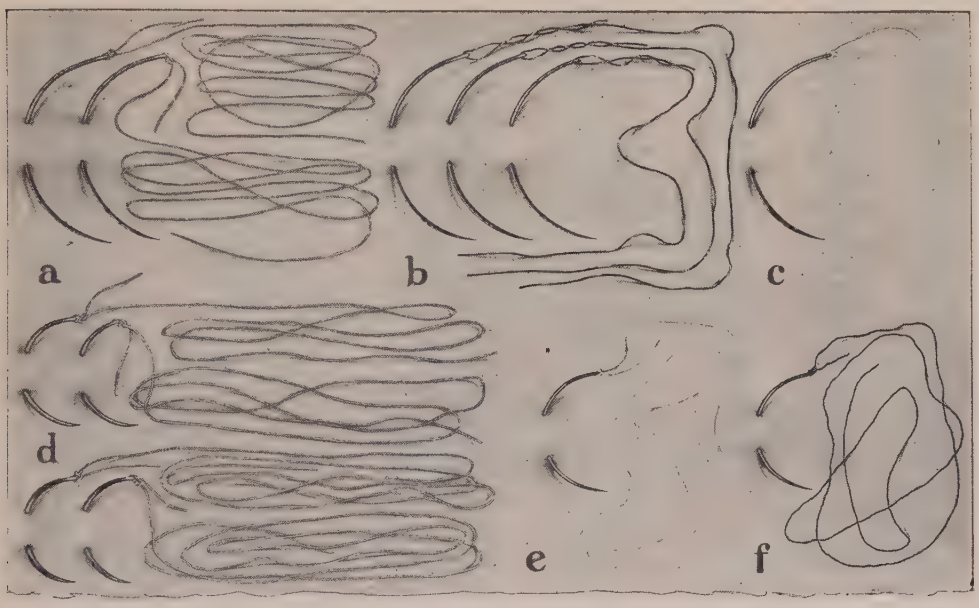


Fig. 812. Sutures and Ligatures Arranged for Abdominal Operation.

a. Two large full-curved needles with cutting points, each threaded with half a suture of 40-day catgut. These are for suturing the deep structures of the abdominal wall. This long-lasting catgut is intended specially for the aponeurotic layer of the wall, but to simplify matters the author uses this for all the layers except the skin.

b. Three large full-curved needles with cutting points, each threaded with a strand of heavy black silkworm-gut. These are for tension sutures in the abdominal wall. More are added as needed.

c. One large full-curved needle with cutting point, threaded with half a suture of plain catgut. This is for approximating the skin margins of the abdominal wound. Some find a straight needle more convenient for this purpose.

d. Four small strong full-curved needles with round points, each threaded with half a ligature of 20-day catgut. These are for ligating pedicles and for general suturing in the pelvis. Some operators use 10-day catgut for this purpose and others plain catgut. The author prefers the 20-day catgut, as it is desirable that firm approximation should be maintained until strong scar-tissue has formed.

e. One slender full-curved needle with round point, threaded with the other half of the suture of plain catgut. This is for use for conservative work about the ovaries or tubes or for tying the meso-appendix or for suturing the fat layer in the abdominal wall when that is necessary.

f. One slender full-curved needle with round point, threaded with eighteen inches of fine black linen. This is for use in excision of the appendix and in any other work for which a fine non-absorbable suture is desired.

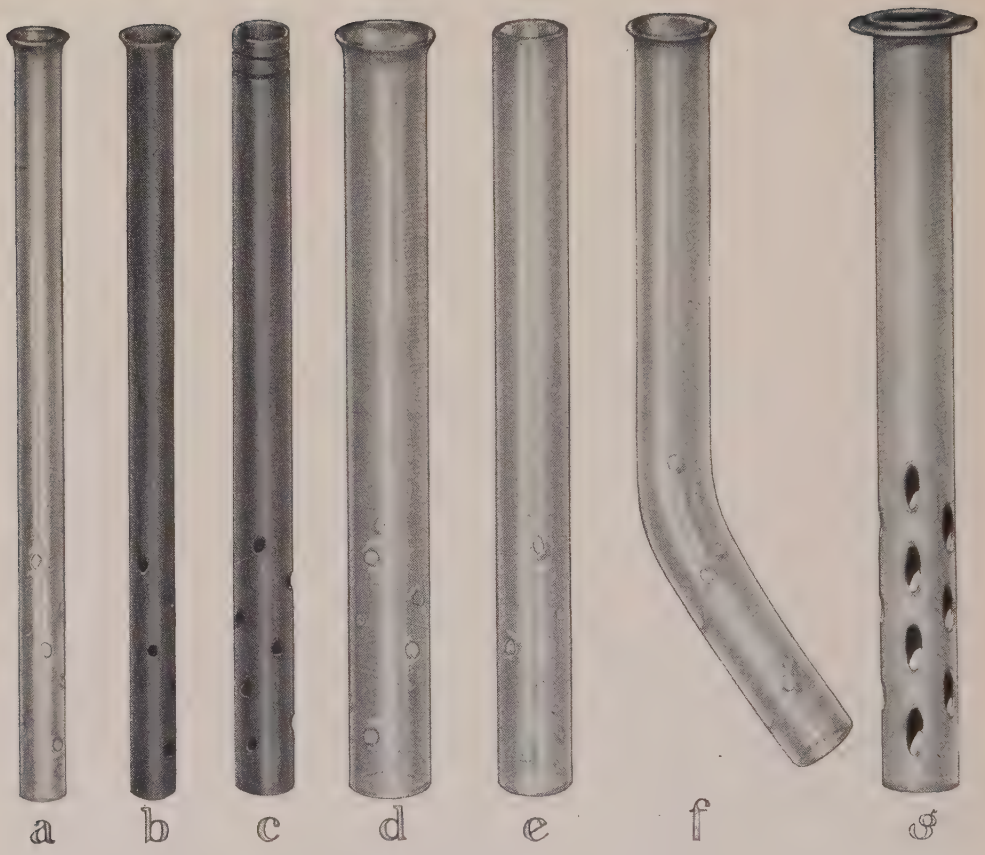


Fig. 813. Drainage Tubes, showing Desirable and Undesirable Forms.

a. Glass drainage tube, 6 inches (15 cm.) in length and the cavity 5/16 inches (0.8 cm.) in diameter. This is the most satisfactory of the glass tubes for pelvic drainage through the abdominal incision. The fluid may be easily cleared out of the tube by means of the gauze wick (Fig. 863) and yet it is so small that there is little danger of hernia through the opening left by it. It has, however, the disadvantage, common to all glass tubes, of being easily broken. The glass drainage tube may break in the instrument satchel, it may break during the boiling or, far more serious than these, it may break in the patient. This serious accident happened once in the author's experience. The patient was very restless, and, in tossing about, broke the glass drainage tube. Fortunately she recovered without serious effects from the accident, but the difficulties and dangers incident to extracting the pieces of glass from the depth of the pelvis were so marked that the author has discarded the glass drainage tube.

b. Hard rubber drainage tube of the same size and shape as *a*. This the author considers the best form of tube for pelvic drainage. It has the good points of the small glass tube (small size and the flare at the top for holding the rubber sheeting slipped over it—see Fig. 862) and at the same time it will not break. However, the author has not found a drainage tube exactly like this ideal, but is using the slightly different form shown next.

c. Hard rubber fiber drainage tube 6 inches (15 cm.) in length and the cavity 3/8 inches (1 cm.) in diameter. The author has had these made out of black fiber tubing, which seems to be largely hard rubber with some fiber embodied in it. This hard black fiber tubing works up better and stands boiling better than the ordinary commercial hard rubber tubing. The walls also are thinner, giving a larger lumen for the same cross-section. It was found not practicable, with the implements at hand, to flare the end for holding the rubber sheeting in place, so two grooves were made about the end as here shown. After the tube is in place and the wound closed, the rubber sheeting is slipped over the end until it catches in the first groove. The sheeting is then pressed down slightly and a ligature is tied about the tube

is found so densely and universally adherent as to preclude its removal intact, necessitating tapping and laying open and clearing out of contents.

Large Tumor Forceps (Fig. 814). Exceptionally a very large tumor forceps, such as is shown in the illustration, may be found useful. Its usefulness is confined principally to cases in which there is a large rounded fibroid impacted in the pelvis in such a way that it cannot be lifted out with the fingers or with smaller forceps.

Wertheim's Parametrial Clamps (Fig. 814), Wertheim's Vaginal Clamps (Fig. 814). The parametrial clamps and the vaginal clamps are required in the

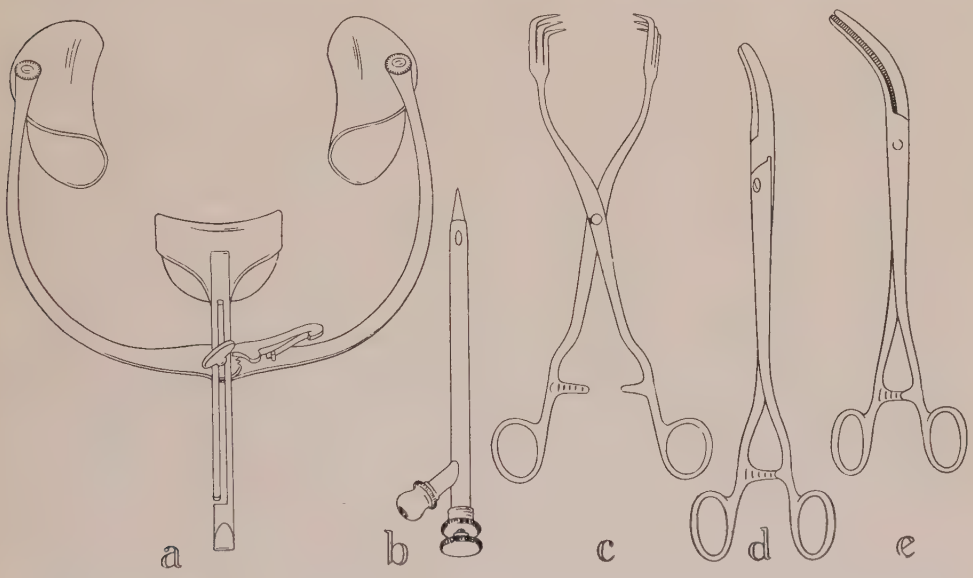


Fig. 814. Special instruments required for special conditions, as mentioned in the text: *a,* Abdominal Spreader; *b,* Large Cyst Trocar; *c,* Large Tumor Forceps; *d,* Wertheim's Parametrial Clamp; *e,* Wertheim's Vaginal Clamp.

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in the second groove. This holds the rubber sheeting in place even better than the flared end does.

d. An undesirable form of drainage tube. It is too large, leaving such a large opening that the chance of hernia is much increased.

e. An undesirable form of drainage tube. There is no flange at the top to hold the rubber sheeting or to prevent the tube from slipping into the cavity.

f. An undesirable form of drainage tube. The bend or curve prevents it being turned around in the drainage tract. A drainage tube of the rigid variety should be turned around once daily in order to prevent granulation tissue from growing into the holes and fixing the tube. The straight tube may ordinarily be turned with little or no pain to the patient. This curved tube, however, could not be turned at all.

g. An undesirable form of drainage tube. This tube is made of aluminum, hence it cannot break like the glass tubes. But it has two objectionable features. In the fluids of the body the aluminum becomes slightly roughened so that the tissues stick to the tube some. Again, the openings are so large that granulations and even pieces of tissue extend into them, causing fixation of the tube. In an instance in the author's experience, one of these tubes became so caught by tissues that it could not be pulled out and, after working several weeks with various expedients in the hope of loosening the tube, it finally had to be literally cut away.

Ordinary soft rubber tubing may be used, if preferred or if the desired hard rubber tube is not available.

radical abdominal operation for cancer of the cervix. The details of these clamps and their use are illustrated in Figs. 530 to 536.

Instruments for Extra-gynecologic Work. In a considerable number of the cases in which the abdomen must be opened for the treatment of some gynecologic disease, there are other pathologic conditions that can be taken care of at the same time. The instruments required for this additional work should, of course, be prepared along with the gynecologic instruments, so as to be ready when needed.

Preparation of Operator and Assistants.

Everything that is to come in contact with the operative field must be sterilized. The hands and forearms of the operator and assistants must be disinfected as far as possible, and should then be covered, so that there is no chance of direct contact of the operative field with the skin of the hands or arms, for the skin cannot be absolutely sterilized. Again, the operator and assistants must be so covered as to effectually protect the field of operation from contamination by particles from the hair or beard, or by particles carried in the breath.

The accomplishment of this thorough protection of the operative wound has been the object of many decades of study and experimentation. The present effective technique for the preparation of the operator, as well as all the other antiseptic and aseptic preparations, was attained gradually, by improvements added year by year, but it is all the direct outgrowth of the epoch-making work of Pasteur and of Lister. The following are the steps in the preparation of the operator and assistants:

1. The sleeves are rolled well up above the elbows and the finger-nails are trimmed short and cleaned thoroughly.

2. The hands and forearms are then scrubbed carefully and vigorously, for ten to fifteen minutes, with warm water and some liquid preparation of green soap—using a stiff brush and giving particular attention to the irregularities about the nails and knuckles and to the spaces between the fingers at their junction with the hand. Where the brush causes undue irritation of the skin, gauze is preferable for scrubbing the arms, but a brush should be used on the hands.

3. Then the soap is washed off with sterile water, and the hands and forearms are scrubbed in 80 per cent alcohol with gauze.

4. Then they are scrubbed in bichloride solution (1-2000), with gauze.

5. The long-sleeved sterile gown is then put on, and the cap and face mask applied. As the rubber gloves are put on, the gauntlet of the glove is brought up over the lower end of the sterile sleeve to hold it in place. The arm is thus securely covered and there is no chance for any skin surface to come in contact with the wound. The assistants go through the same process.

The process of hand-disinfection just given is known as the "alcohol-bichloride" method. It is called also, from its originator, the Fürbringer method.

The careful and prolonged scrubbing with soap is the most important feature in any method of hand-disinfection. This fact has long been recognized, and many operators have discarded bichloride and other irritant antiseptics and depend entirely on the soap-scrubbing followed by the scrubbing in alcohol. When carried out with care and judgment, this practice is safe and gives good results and avoids the irritation due to bichloride. In some individuals, however, alcohol causes more irritation than bichloride.

There are *three methods of hand-disinfection* which are much used. The thorough scrubbing with green soap and warm water is common to all of them. The further steps differ as follows:

a. The "alcohol-bichloride" method. The various steps in this method have been given in detail above.

b. The "permanganate and oxalic acid" method. The hands and forearms are next immersed in a hot saturated solution of potassium permanganate and kept there until the skin takes on a dark brown color, then they are immersed in a hot saturated solution of oxalic acid until the skin again has its natural color. The oxalic acid is washed off in sterile water or sterile lime water.

c. The "chlorinated lime and sodium carbonate" method. After the preliminary scrubbing, a tablespoonful of chlorinated lime is taken in the palm of the hand and moistened with enough water to make a thick paste. Then a piece of sodium carbonate (washing soda) about the size of the thumb is crushed in the hand and rubbed thoroughly into the lime paste. This mixture, containing nascent chlorine, is rubbed vigorously into the skin of the hands and forearms for three to five minutes. The parts are then washed in sterile water, and later in weak ammonia water to remove the chlorine odor.

As to the choice of method of hand-disinfection, that is largely a matter of personal preference. Any one of the above three methods, properly carried out will give good practical hand-disinfection—i.e., from hands and arms so prepared, infection will rarely if ever take place. The important thing is not which method is chosen, but *how thoroughly* the chosen method is carried out.

Absolute disinfection of the hands and arms is impossible by any method, as the disinfection is necessarily confined to the superficial layers of the epidermis. Bacteria situated in the deeper layers of the epidermis may work to the surface during the course of the operation—hence the importance of thoroughly covering the prepared hands and arms with rubber gloves and sterile sleeves, leaving no skin-surface exposed.

Special Points in Anesthesia.

Great changes have taken place in the field of anesthesia in recent years. Anyone suddenly transported from the former times, when the choice lay between chloroform and ether, to the present time, would be bewildered by the many choices possible today. The subject has expanded so much that a consideration of it requires a good-sized volume in itself. Anyone assuming the

responsibility of anesthetizing patients will find satisfactory help and guidance in the excellent and exhaustive text-books now available, which take up systematically the indications, contraindications and details of administration of the various forms of general anesthesia and regional anesthesia and local anesthesia.

Fig. 815. The Safe Position of the Arms during Anesthesia. The elbows are brought to the patient's sides and the forearms rest comfortably against the chest, where they are held by the sleeves pinned to the gown.

There is neither space nor occasion in this work for a consideration of the subject of general anesthesia. It may be well, however, to call attention to some special points.

Position of arms. During general anesthesia, induced by any of the various agents (ether, nitrous oxide and oxygen, chloroform or other chemical), the

position of the arms is a point of importance. Many cases of paralysis of one or both arms following anesthesia have been reported—the paralysis lasting for many months and sometimes longer. It is due largely to the faulty position of the arms. This is a serious matter and attention should be called to it in every work dealing with anesthesia. Several years ago the author reported two cases of such brachial paralysis in detail and called attention to previous

Fig. 816. A Dangerous Position of the Arms during Anesthesia. Many cases of paralysis of one or both arms from this position have been reported

work and investigation on the subject, and demonstrated, directly on the cadaver, the compression of the brachial plexus by the clavicle when the arm is above the head. As stated in the article, this has long been recognized as the cause of the paralysis, the attention of the profession generally having been first called to the subject by Budinger in 1894. Fig. 815 shows the safe

position for the arms during anesthesia. No cases of paralysis have ever occurred, as far as known, when the elbows were kept to the side, as here indicated. Fig. 816 shows a dangerous position of the arms, present in the author's two cases and in most of the reported cases of paralysis affecting the brachial plexus. Figs. 817 and 818 serve to call attention to the anatomical features of the trouble. Fig. 819 shows another dangerous position of the arm during anesthesia, this position being liable to lead to peripheral paralysis from pressure on the nerve by the edge of the table.

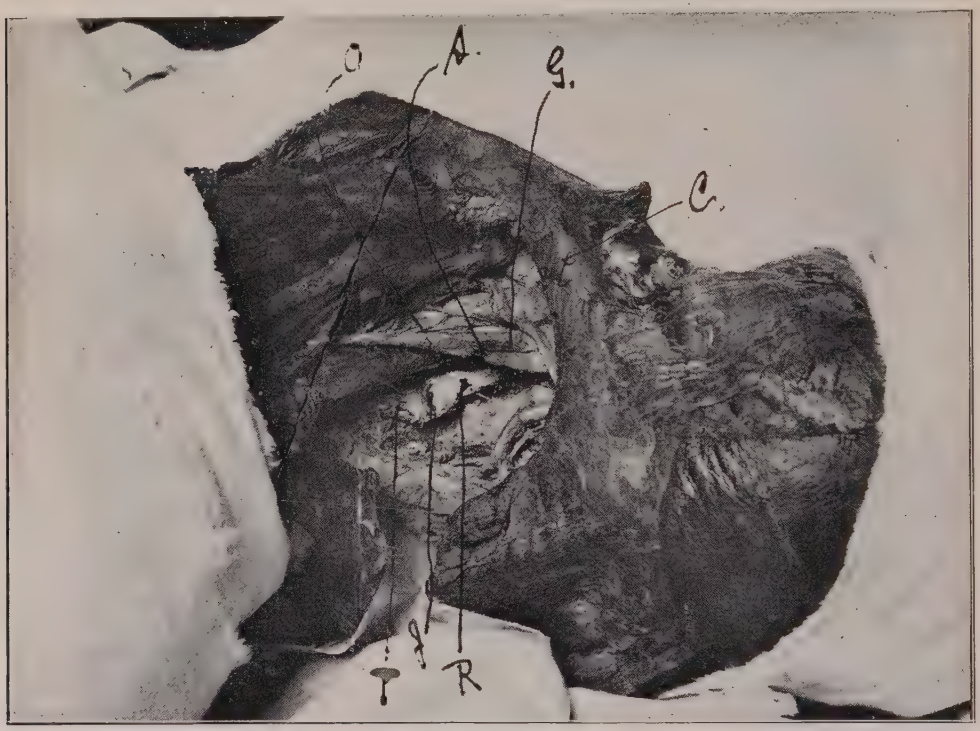

Fig. 817. View of the Dissected Area in a Cadaver, in which the arm was brought above the head, as shown in Fig. 816. *C.* Clavicle. *R.* First rib. *T.* Transverse process of first dorsal vertebra. *O.* Outer trunk of brachial plexus. *S.* Stump of suprascapular nerve. *G.* Compression groove made by the clavicle when the arm was above the head.

TECHNIQUE

The technique of abdominal section may be conveniently divided into the regular steps and the special points.

REGULAR STEPS.

The regular steps incident to every abdominal section for gynecologic disease are as follows:

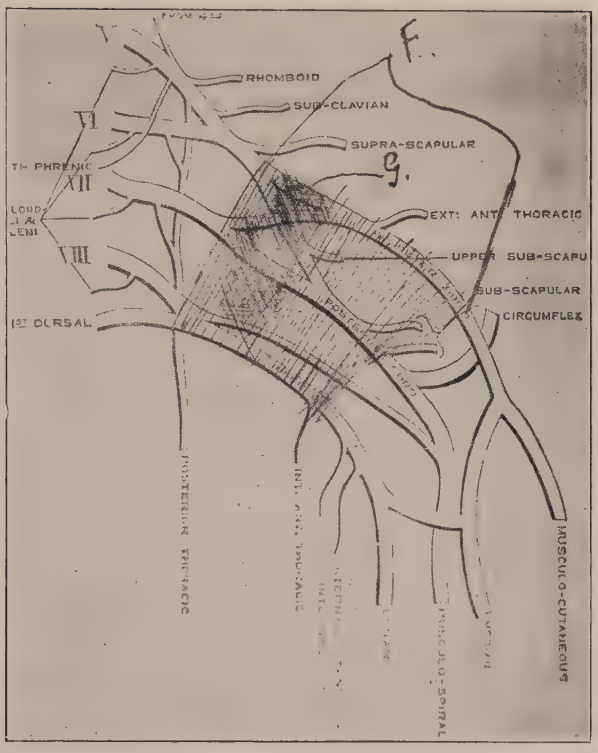

Fig. 818. Diagram of left Brachial Plexus from Gray's Anatomy. *F.* Probable field within which would occur the lesion producing the symptoms mentioned in the reported cases. *G.* Location of compression groove in this cadaver.

Fig. 819. Another Dangerous Position of the Arm during Anesthesia.

1. Incision.
2. Exploration.
3. Correction of pathological conditions.
4. Toilet of peritoneum.
5. Closure of incision.
6. Dressing.

1. Incision.

In abdominal section for pelvic disease, the incision employed is usually longitudinal and in the median line. All parts of the pelvis and lower abdomen may be easily reached from such a median incision, and in practically every case

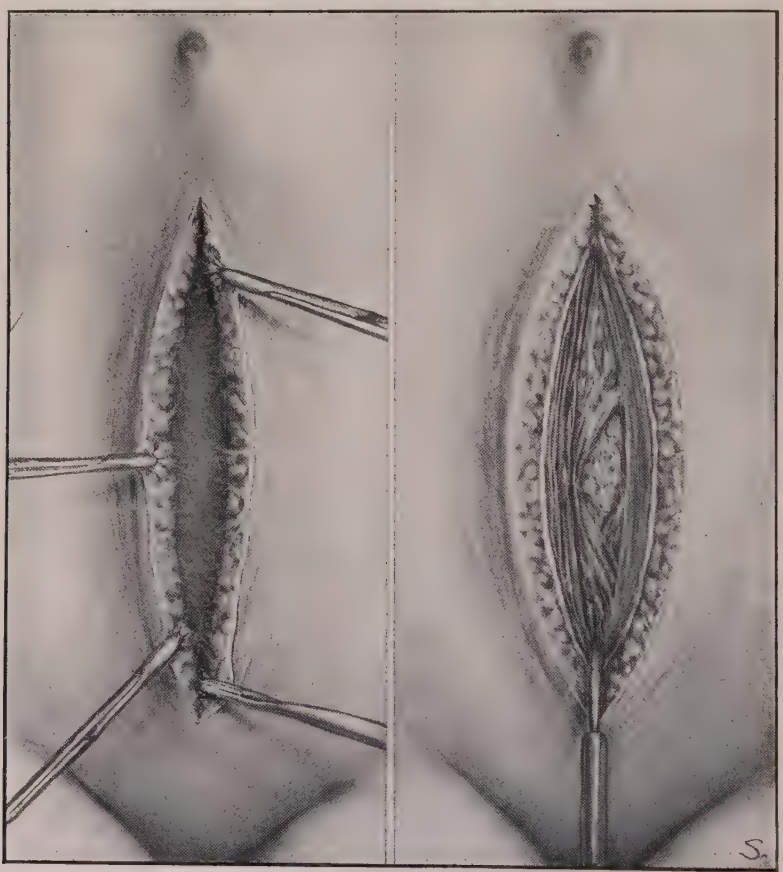

Fig. 820. Fig. 821.

Fig. 820. Making the Abdominal Incision. The skin and superficial tissues have been incised, exposing the aponeurosis. The forceps are clamped on bleeding points in the subcutaneous tissue—they do not include the skin.

Fig. 821. The aponeurosis has been divided, the division being practically in the median line, and the right rectus muscle has been separated from the intermuscular septum. The muscle is seen to the right and the septum to the left.

exploration of the whole region should be made. Ordinarily the incision extends from an inch or two (2.5 to 5 cm.) below the umbilicus to the symphysis pubis (Fig. 820). If there is a large tumor, the incision must be extended upward, though at first it is usually made the ordinary size required for exploration with the hand. As a rule the primary incision is about four inches (10 cm.) long. If the abdominal wall is very thick, it must be longer; if very thin, it may be shorter. The lower the incision is placed, the more easily the deeper portions

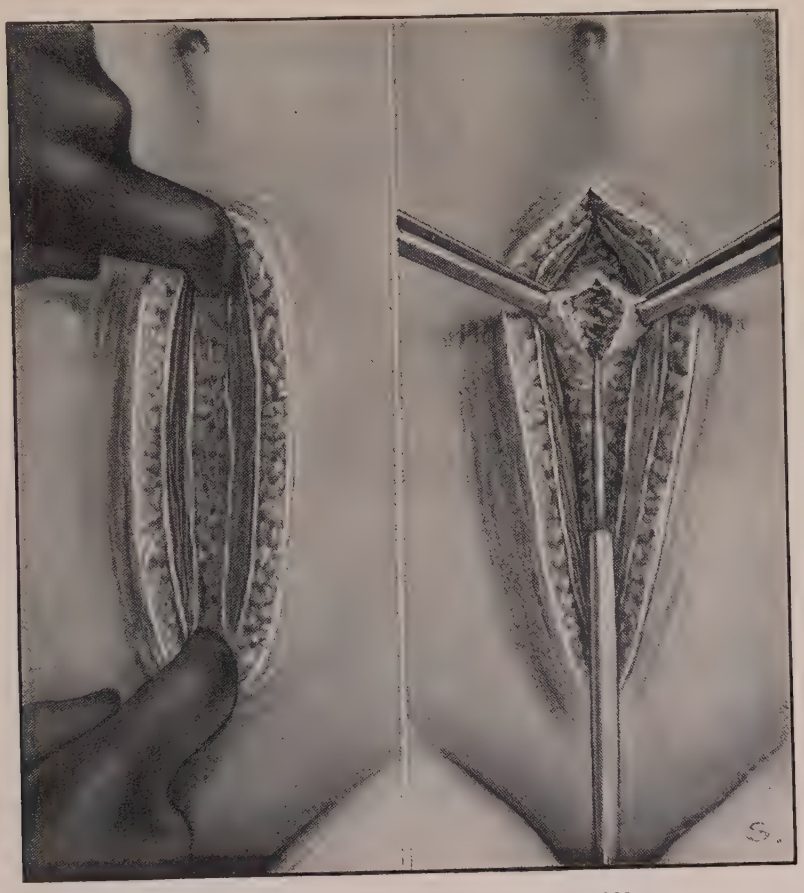

Fig. 822. Fig. 823.

Fig. 822. The few remaining muscular fibers at the bottom of the wound are cleared away by placing the two index fingers together in the center of the wound and then separating them to the angles, as here shown.

Fig. 823. Dividing the subperitoneal fat.

of the pelvic cavity may be reached, but in extending the incision low care must be exercised to avoid injury to the bladder.

In cutting through the abdominal wall, it is not necessary to strike accurately the tendinous tissue between the recti muscles. If the incision is made a little to one side of the tendinous median line and includes some of the rectus muscle

of that side, it makes little difference. Consequently, no time should be lost in trying to make a careful dissection exactly in the median line.

The incision is made through the skin and the subcutaneous fat and fascia, as indicated in Fig. 820, and the bleeding vessels in the fat are caught with forceps. The incision is then continued through the rectus muscle with its tendinous sheath down to the subperitoneal fat, as shown in Fig. 821.

The next step is to divide the subperitoneal fat and peritoneum. The first

Fig. 824. Fig. 825.

Fig. 824. Continuing the division of the subperitoneal fat. After one cut is made, deeper portions are picked up and divided, and thus the process is continued until the peritoneum is reached. In dividing through the fat care should be taken to work directly downward toward the peritoneum, and not laterally in the subperitoneal space.

Fig. 825. Picking up the peritoneum, preparatory to incising it. It is first caught and lifted from the intestine and then the lifted portion is caught with another forceps.

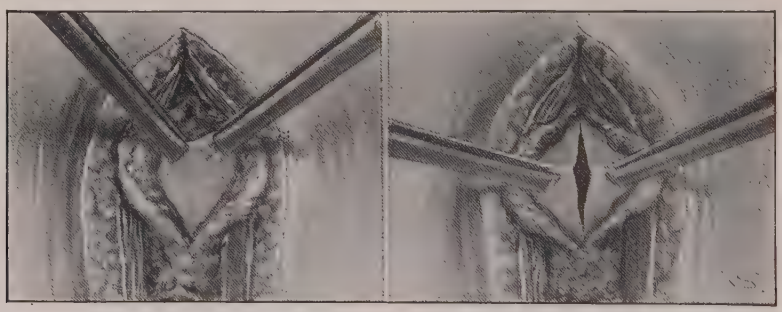

Fig. 826. Fig. 827.

Fig. 826. While the peritoneum is held up with the second forceps the first forceps is released, so that any portion of intestine caught in it may drop away, and then the peritoneum is again caught with the forceps. By this process, repeated if necessary, the peritoneum may be separated from the intestine, which is sometimes inclined to adhere to it.

Fig. 827. The peritoneum incised. Notice that the opening is made at the upper part of the abdominal wound, in order to avoid the bladder, which may be pushed up by a tumor or pulled up by adhesions.

small opening into the peritoneal cavity should be made in the upper portion of the incision to avoid injury to the bladder, which may be drawn up by an underlying tumor or inflammatory mass. The subperitoneal fat is caught up by a dissecting forceps on each side and incised between the forceps (Fig. 823). A

deeper portion is then caught up on each side and divided (Fig. 824). In this process of working through the fat, it is important to progress directly downward toward the cavity, and not to one side. Unless this point is watched, the dissection may extend along beside the peritoneum and thus considerable time will be lost searching for the latter, particularly in the cases where there is a large amount of subperitoneal fat. When the peritoneum comes into view (Fig. 824) it is picked up with a forceps, to lift it from the intestine. While thus raised, it is caught with another forceps, as shown in Fig. 825. The first forceps is then opened to release any underlying intestinal loop that may have been held by it, and it is made to grasp the raised peritoneum at another point (Fig. 826). This process is continued until it is evident the raised peritoneum is clear of intestine.

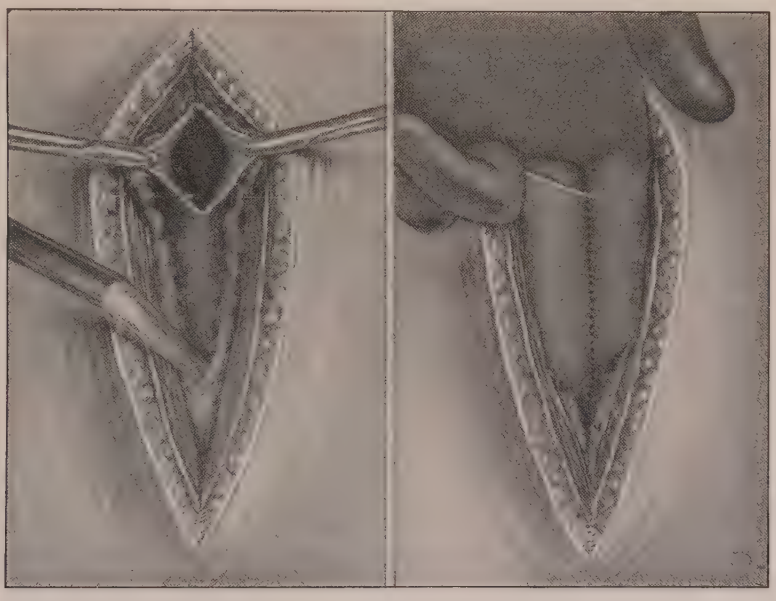

Fig. 828. Fig. 829.

Fig. 828. Dividing the subperitoneal fat down to the symphysis. This is easily accomplished by blunt dissection by running the laparotomy scissors down as here indicated.

Fig. 829. The peritoneum has been raised by slipping the fingers under it, preparatory to dividing it as indicated by the dotted line. The peritoneum is thin and translucent, and by raising it on the fingers the absence of the bladder from the part to be divided may be positively determined.

In some cases the peritoneum is so thin that the absence of intestine or omentum may be determined by sight. In other cases it may be determined by touch. The peritoneum is then divided between the dissecting forceps (Fig. 827), and the edges of the small opening are grasped with artery forceps (Fig. 828). In cases of inflammation in the lower abdomen, the intestinal coils may be adherent to the peritoneum, and particular care is necessary to avoid injury to the intestine. This danger is most marked in secondary operations, where the intestine may be firmly bound by organized adhesions to the peritoneum in the vicinity of

the incision. In such a case it is advisable to extend the exposure of the peritoneum laterally as far as necessary to find a clear area before attempting to open the same.

The next step is to enlarge the deep portion of the incision downward and upward to the full extent of the superficial portion. A convenient way to complete the division of the subperitoneal fat is by blunt dissection with the scissors, as indicated in Fig. 828. With the heavy blunt-pointed laparotomy scissors this division of the fat may be quickly carried to the symphysis without danger of injuring the bladder. The peritoneum is then lifted by the fingers and divided with scissors, as indicated by the dotted line in Fig. 829. The divided peritoneum is then caught on each side at the lower part of the incision and lifted out of the wound, as shown in Fig. 830. This enables the operator to see just where the

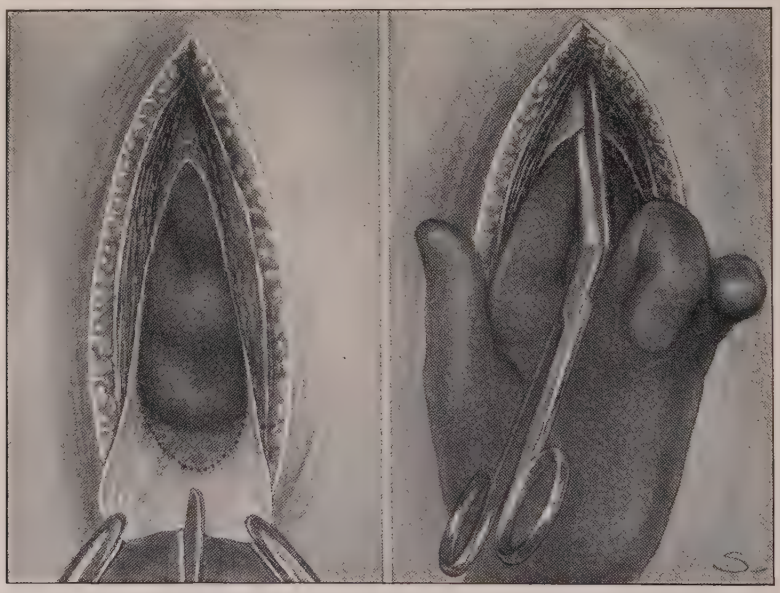

Fig. 830. Fig. 831.

Fig. 830. Dividing the peritoneum close to the bladder. By drawing up the lower area of peritoneum with forceps, as here indicated, the opaque bladder wall may be seen and the peritoneum divided accurately to it without danger.

Fig. 831. Dividing the peritoneum at the upper angle of the wound. Here the intestinal coils crowd into the way and may be clipped unless the area to be divided is carefully protected by the fingers underneath, as here shown.

opaque bladder begins (location indicated by dotted line in Fig. 830), and the translucent peritoneum may be safely divided down to it. The peritoneum at the upper angle of the wound is then divided while the intestines are pushed away and carefully protected by the fingers under it (Fig. 831).

Before beginning the internal work, it is well to protect the divided tissues of the abdominal wall by towels. The edge of a towel may be fastened to the peritoneum of each side by hemostatic forceps, as shown in Figs. 832 and 833.

Another method is to attach the edge of the towel to the opposite side of the wound, as shown in Fig. 834, and throw the forceps and towel over to that side. By this maneuver the holding-forceps are covered by the towel, as shown in Fig. 835. Still another method of holding the protecting towels in place is to tuck them around the wound margins and then introduce the retractors for holding the wound open, as indicated in Fig. 836.

Rectus incision. Some operators prefer to make the incision through the aponeurosis over the rectus muscle of one side, usually the right. The skin incision may be made in the median line. The skin and fat are retracted and the aponeurosis is incised some distance from the median line, over the rectus muscle. The muscle is then split longitudinally or retracted as preferred, and

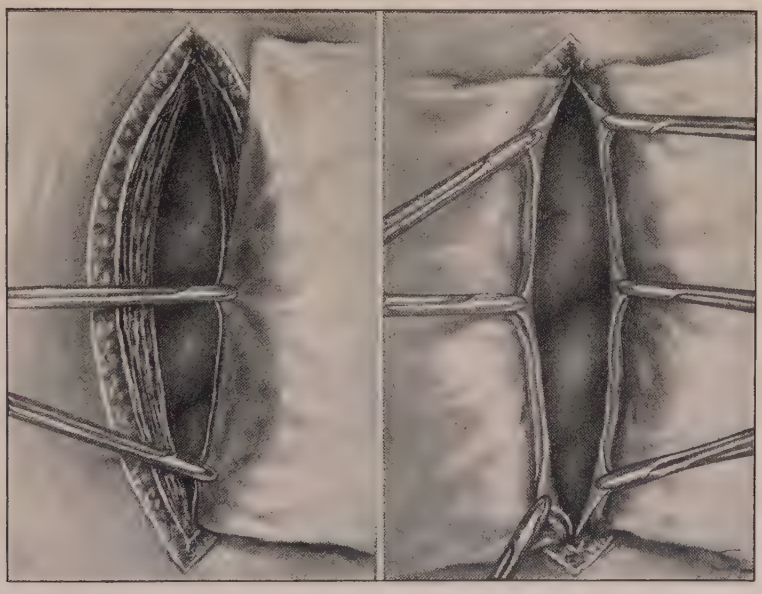

Fig. 832. Fig. 833.

Fig. 832. Attaching a towel to the peritoneum, to protect the cut tissues of the abdominal wall during the subsequent steps of the operation. Ordinary forceps may be used, as here indicated, or special peritoneum-towel forceps (Fig. 810).

Fig. 833. The towel attached on each side and the incision ready for the intraperitoneal work.

the cavity entered by an incision immediately under the upper aponeurotic incision. The advantage of this procedure is that it insures the interposition of a layer of muscle between the upper and lower lines of approximation, thus giving a wide area of union instead of the narrow one that results when the upper and lower lines of approximation fall practically together without intervening muscle.

The interposition of muscle to separate the peritoneal and the aponeurotic lines of approximation in the abdominal wall may, in the opinion of the author, be better attained by using the median incision and, in the closure, dividing

the intermuscular septum and approximating the two muscles in the median line by light suturing, as shown in Figs. 847 to 849.

Transverse incision. The transverse incision, known also as the Pfannenstiel incision, is considered by some operators the preferable incision for pelvic work. It is made by the following steps:

1. A transverse incision with a slight downward curve is made through the skin and superficial tissues, the middle of the incision crossing the median line about 1½ inches (4 cm.) above the pubic bone (Fig. 837). The length of the incision is 3 to 4 inches (8 to 10 cm.), and it lies largely within the region of the pubic hair.

2. The same incision is continued down through the aponeurosis to the recti muscles but not through the muscles. The upper flap, consisting of skin, fat

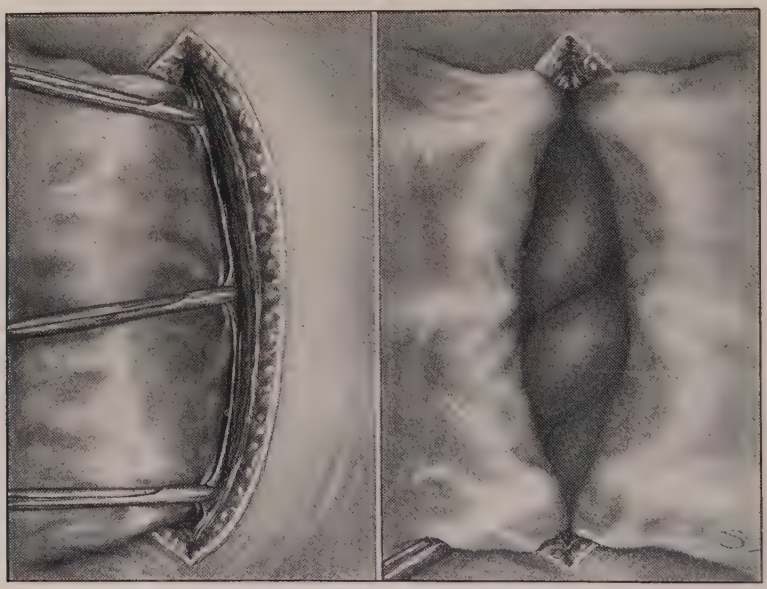

Fig. 834. Fig. 835.

Fig. 834. Another method of attaching the towels. The towel from one side is attached to the peritoneum of the opposite side, as here shown, and then the towel and forceps are thrown over the side of attachment, as shown in Fig. 835.

Fig. 835. The towel attached on each side and the incision ready for the intraperitoneal work. Long forceps, such as are recommended for abdominal work, lie out of the way very well when arranged as in Fig. 833, consequently there is no necessity for catching them under the towels, as here shown, except when the abdominal wall is very thick, as in extremely stout patients.

and aponeurosis, is then raised, the fibrous septum between the muscles being divided by scissors or knife (Fig. 838), as needed to permit this flap being raised to the required extent. When completely loosened, the flap is held out of the way by a retractor or otherwise.

3. The muscles are then separated in the median line and the peritoneum divided to the required extent by a median incision (Fig. 839).

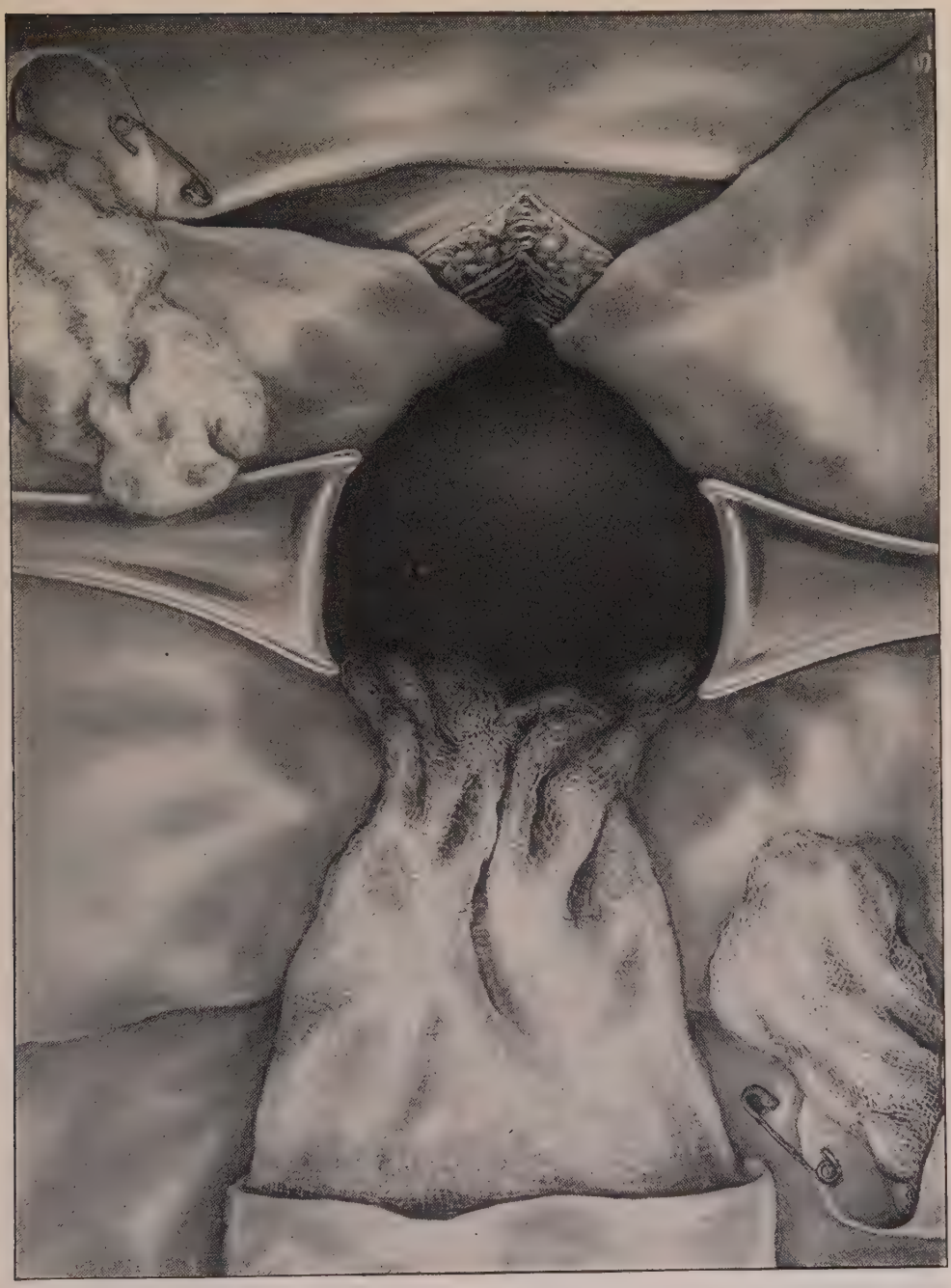

Fig. 836. Another method of arranging the towels to protect the abdominal wall. The towel on each side has been simply tucked about the wall and is held in place by the retractor. The patient is represented in the Trendelenburg, posture, with the observer looking down into the cavity from behind the anesthetist. The lower angle of the wound, which should also be covered, is here left bare for identification.

4. Retractors are then introduced to give the necessary exposure (Fig. 840).

It is preferable to keep the incision within the area of pubic hair when sufficient working room can be thus secured. If necessary the incision may be extended further on one or both sides. Tranverse division of the recti muscles is permissible when required to give sufficient working room. In fact, some oper-

Fig. 837.

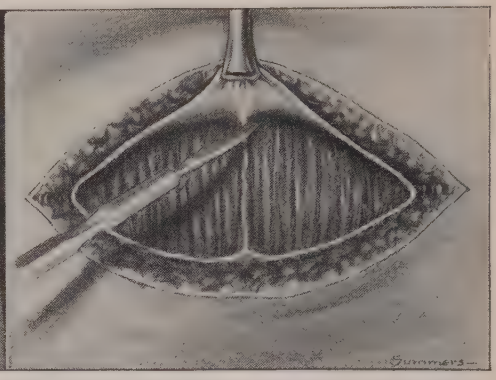

Fig. 838.

Fig. 837. The Transverse Abdominal Incision. The skin incision is here shown. It is made with a slight downward curve and crosses the median line about 1½ inches (4 cm.) above the pubic bone. The length of the incision is about 4 inches (10 cm.) and may be made largely within the region of the pubic hair.

Fig. 838. The incision has been extended down through the fat and fasciæ and aponeurosis to the muscles.

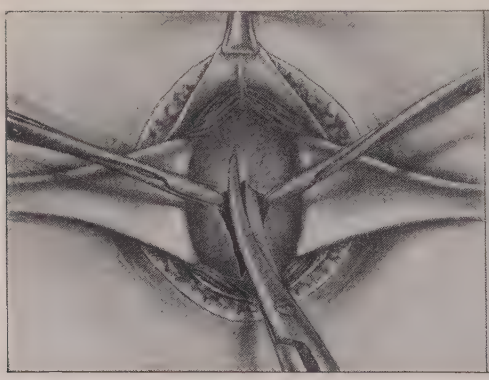

Fig. 839.

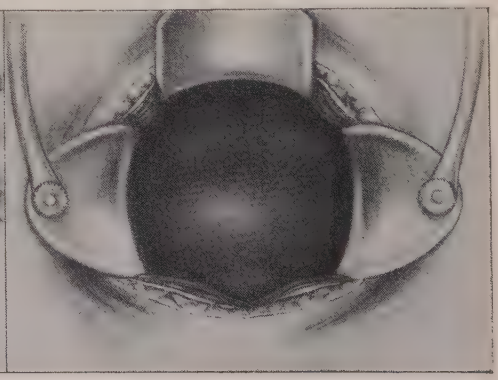

Fig. 840.

Fig. 839. The aponeurosis has been retracted upward and the recti muscles laterally, and the peritoneum is being incised in a longitudinal direction.

Fig. 840. The transverse incision has been completed and the retractors are in place for providing the required operative space.

ators employ this as the routine technique, making the transverse cut through all tissues, including the muscles and the peritoneum.

The upper flap may be held out of the way by a retractor, as already mentioned, or by traction on the aponeurosis by means of a forceps or a suture.

When all the tissues are divided transversely, the upper peritoneum may be rolled upward and outward, or it may be sutured temporarily to the posterior wall of the abdomen, after the intestines have been pushed up out of the way. When sutured across the cavity the peritoneal flap serves to keep the intestinal coils out of the pelvis during the subsequent steps of the operation.

The advantages of the transverse incision are, (1) the full length of the incision is placed where most needed, viz., over the pelvis, (2) it prevents postoperative hernia, for the suture lines do not lie immediately under each other but cross at right angles, and (3) the scar is hardly noticeable after the growth of the pubic hair. The disadvantages are, (1) the extensive area of tissue traumatized increases the seriousness of infection in the wound and increases the chance of oozing and hematoma, (2) proper exposure requires persistent and strong retraction in three directions, and, (3) it is not suitable for difficult work in the region of the umbilicus or above, which work is not infrequently required in gynecologic cases, and the necessity for such work may not be apparent until the abdomen is open.

2. Exploration.

When the proper opening has been made, the hand is introduced into the peritoneal cavity and the various pelvic organs are outlined and the pathological conditions determined as accurately as possible. It is well to go about the exploration in a systematic way.

The first step is to clear out the intestinal coils from the lower abdomen, so that the pelvic organs may be seen and palpated. This step is facilitated by having the patient in moderate Trendelenburg posture, i. e., with the shoulders considerably lower than the hips. Then with the wide gauze strip, wrung dry out of hot saline solution, the intestines are pushed up and held out of the field. Of course, if some of the intestinal loops are adherent in the pelvis, the adhesions must be broken before the loops can be pushed up. In some cases the omentum will be found adherent in the pelvis, thus covering over and obscuring everything, even the intestinal coils. The adherent omentum must be separated and pushed up (Figs. 627 and 628). Occasionally the margin of the omentum is so extensively or densely adherent that it is preferable to excise the adherent portion.

The omentum and intestines having been pushed out of the field, the examination of the pelvic organs proper begins. The uterus is the central landmark. When that organ has been recognized, the other structures, though greatly distorted, can be identified by their relation to it. The rounded corpus uteri can usually be easily seen and palpated and any marked abnormality determined. If turned back into the hollow of the sacrum, it must be brought forward for identification and critical palpation.

Next, the adnexa of each side are to be palpated and inspected. There are

different methods of bringing the ovary and tube up into the wound for inspection. One method is to grasp the uterus with the special holding-forceps and bring it up, the tube and ovary following as indicated in Fig. 841. Another expedient is to grasp the round ligament with an ordinary forceps and by this means draw it and the adnexa up into the wound for inspection, as shown in Fig. 842. The most convenient method usually is to introduce the hand, palpate the various structures and then pick up the adnexa with the fingers, as indicated in Fig. 843, first on one side and then on the other.

Other structures to be considered in the examination are the parametrium, bladder, ureters, glands (in carcinoma), rectum, sigmoid, appendix, cæcum, ascending colon (constricting membrane) and adjacent ileum (bands, kinks).

Fig. 841. Beginning the Intraperitoneal Work. The intestinal coils have been packed away from the pelvis and the corpus uteri has been examined, and the next step is to examine the adnexa by palpation and inspection. There are different ways of bringing the adnexa into view. One method consists in grasping the corpus uteri with a non-cutting holding-forceps and bringing it up into the incision and to one side, thus exposing the adnexa on the opposite side, as here shown.

A method formerly much in vogue, but now fortunately almost obsolete, is to make a very small incision (Fig. 844) and through this introduce two fingers, with which search is made and the adnexa finally brought up, as shown in Fig. 845. This is a dangerous practice. In practically every case where abdominal section is really indicated, the trouble is serious enough to require inspection of the pelvic structures and a much more careful and satisfactory palpation than can be made with two fingers. Good exposure of the pelvic interior permits a better appreciation of the pathological conditions and a more accurate correction of the same. At the same time it reduces the chance of injury to adjacent structures.

3. Correction of Pathological Conditions.

After exploring the pelvic cavity and lower abdomen and ascertaining the exact conditions present, the operator proceeds to deal with the lesion or lesions according to established principles and technique, which principles and technique are set forth in the preceding chapters.

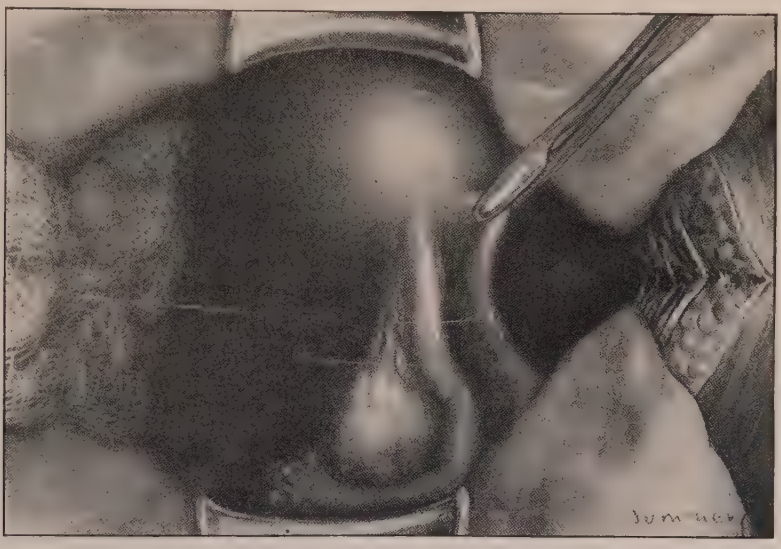

Fig. 842. Another method of lifting the adnexa. The round ligament is caught close to the uterus and drawn upward, bringing the uterus and adnexa into view.

Fig. 843. Another method of lifting the adnexa. With the fingers introduced under them, the ovary and tube are brought up into the wound for examination and treatment.

This is the most convenient method for most cases, fitting in nicely with the other steps in pelvic palpation.

The determination as to what is best to do is not always an easy matter. In many cases the decision as to what to do and what not to do is the most difficult feature in the whole case. On it rests the freedom of the patient from subsequent serious disturbance and consequently, to a considerable extent, her future happiness. Shall the damaged ovaries be removed or subjected to conservative operation? Shall the chance of pregnancy be preserved by leaving a portion of a tube that may later cause trouble? Shall the myomata be treated by myomectomy or by hysterectomy? Will the preservation of a thickened and chronically inflamed uterus prove ultimately beneficial or harmful to the patient? Is the malignant disease (uterine or ovarian, as the case may be) really operable, judged according to the probability of immediate and remote comfort to the patient? Is the patient's life and comfort, in a case of old organized adhesions throughout the pelvis, best protected by breaking up the adhesions in every direction or by removing the obvious lesion with a minimum disturbance of adhesions? The list of questions could be extended indefinitely but this is sufficient to call attention to the serious problems encountered. The conscientious gynecologist must bring to

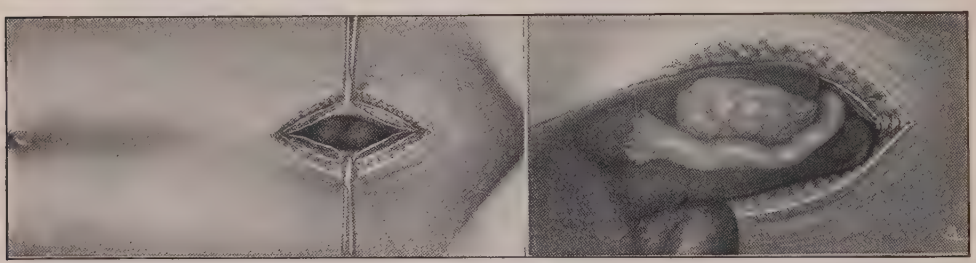

Fig. 844. Fig. 845.

Figs. 844 and 845. An Unsafe method of operating. It was formerly the custom to operate through a very small abdominal incision, as indicated in Fig. 844, supposedly the smaller the better. Through this limited incision two fingers were introduced, the pelvis explored and adhesions broken by touch alone, and the adnexa brought up for removal, as shown in Fig. 845.

In practically every case in which abdominal section is really needed, the incision should be large enough to permit of seeing as well as palpating in the pelvis. Only thus can the required safety and accuracy be attained.

bear all possible knowledge of the physiology and pathology and reparative powers of the organs involved, an understanding of the patient's circumstances and wishes, and a judgment based upon close study, accurate observation and a sympathetic consideration of the patient's comfort and usefulness.

Most of the questions thus encountered in the exploration may be answered promptly and positively in the individual case. A few of the problems present features which have not yet been fully worked out. But the uncertain features are being eliminated gradually, as more and more reliable information becomes available.

Lesions of adjacent structures may be found, either associated with a gynecologic lesion or causing symptoms attributed to a supposed gynecologic lesion

which was not present. The gynecologist should of course be prepared to treat such commonly encountered lesions according to established usage as set forth by authoritative works on those subjects. There is one question that recurs so frequently in gynecologic work that it merits attention here. Should the appendix be removed in every case of abdominal section in which the patient's condition will permit? On this point there is decided difference of opinion among operators and there is a good deal to be said on each side. Some consider it inadvisable, with the abdomen open, to leave this structure, which may cause a second operation and may cause the patient's death in spite of operation. Others consider it inadvisable to open the intestinal tract in the operative field and thus run the chance of subsequent leakage and possibly fatal peritonitis, simply to remove a structure that is causing no trouble and may never cause trouble. The author has solved this problem to his own satisfaction by the adoption of the rule that the appendix is to be removed only for a definite reason. The accepted reasons are four in number and as a matter of fact cover most cases. The reasons are as follows: 1. If the appendix is obviously diseased. 2. If there have been symptoms indicating disease of the appendix. 3. If the appendix lies into the operative field so that it is likely to be caught in the reparative exudate. 4. If the patient requests its removal.

4. Toilet of the Peritoneum.

Bleeding having been completely controlled, the blood and clots are sponged out of the pelvis and, as far as practicable, the pedicle ends are turned under and all raw surfaces covered with peritoneum. All abdominal sponges are then removed, the intestines are permitted to come back into the pelvis (the patient having been lowered from the Trendelenburg posture) and the omentum is spread out in its proper place. The objects of the toilet of the peritoneum are to remove all injurious substances, to restore the structures to approximately their normal relations and to prevent serious adhesions.

The prevention of serious adhesions is a problem not yet wholly solved. In every case of operation, more or less reparative exudate is thrown out. This splints the injured tissues and aids in repair, somewhat on the same principle as callus about a broken bone. If everything goes well this reparative exudate is absorbed to a greater or less extent. In some cases practically all of it disappears while in other cases a considerable portion remains as definite organized adhesions. In many cases where extensive adhesions remain, no symptoms result. In other cases post-operative adhesions cause troublesome symptoms, the most serious of which is intestinal obstruction. So it is evident that some adhesions cause trouble and others do not.

The preventive measures have two objects: first, the prevention of all adhesions as far as practicable and, second, the avoidance in particular of those special adhesions which are most likely to cause serious trouble. The first object is obtained by a rigid asepsis to prevent all infection, by the minimum handling and

roughening of the peritoneal surfaces, by the protection of the intestines by moist gauze pads, by the turning in of all raw ends and edges and by the complete removal of all irritating materials from the peritoneal cavity at the close of the operation. In regard to the second object, it has been found that the adhesions of the small intestine are the ones that are most likely to lead to serious trouble. Consequently, as the toilet of the peritoneum is made, special care is taken to keep the coils of the small intestine away from the irritated peritoneum in the depth of the pelvis and away from the sutured peritoneum at the site of the abdominal incision. The small intestines may be kept out of the depth of the pelvis more or less by pushing the coils up and allowing the cæcum and sigmoid to come together across the pelvis (Fig. 405) or as near together as possible. In certain extensive operations it is practicable to use some of the peritoneal flaps for closing off the pelvic cavity from the abdominal cavity and thus excluding all intestinal coils from the former. This "peritonization" is very important in cases of extensive pelvic denudation and merits further study and more general use. To prevent adhesions of the small intestine to the line of incision, the omentum is to be spread immediately under the incision. Adhesions between the omentum and the line of incision rarely cause trouble. In certain cases the omentum may be used to assist in keeping the small intestines away from irritated areas in the pelvis. However, the omentum varies much in length in different cases, sometimes being very short. Even when long, it should not be tucked down forcibly into the pelvis, for omental adhesions with tension will very probably cause troublesome symptoms.

Much experimentation has been carried out with the idea of preventing adhesions by the introduction of foreign substances into the peritoneal cavity. Oils of various kinds and membranes have been used. Some operators have become quite enthusiastic about one substance or another. It is to be hoped that a reliable method will eventually be developed, but for the present the author does not feel justified in making any recommendation.

5. Closure of Incision.

The peritoneal edges of the wound are lifted with forceps, so as to be clear of intestine and omentum, and then approximated by a catgut suture. For this purpose it is convenient to use the ordinary running suture, locked at intervals, as shown in Figs. 846 and 847. Care should be taken to see that the raw peritoneal edges do not turn down into the cavity. To insure against this, the two edges may be brought out, the peritoneal surfaces near the edges approximated and then united by passing the needle back and forth from side to side through both layers simultaneously. This unites the peritoneal surfaces by a running mattress suture, leaving the peritoneal edges above the line of union. However, by exercising some care, the peritoneal edges may be kept out with the ordinary running suture, particularly if the needle is occasionally passed by the side to side method, instead of passing over the edges, at points where there is a special

tendency of the edges to turn in. Another item is the tearing of the peritoneum. In cases where there is some tension and the peritoneum is thin or friable, it may tear with each suture, and the deeper bites taken to bring it together only cause larger tears. This difficulty is overcome by picking up some of the muscle along with the peritoneum in the first row of sutures. The peritoneal sutures, and in fact all sutures in the abdominal wall, are ordinarily placed with large needles that can be conveniently handled without a needle-holder. In cases where the wound is very deep, on account of a thick wall, it may be advisable to use a needle-holder here and there in the work.

After the peritoneum is sutured, the intermuscular septum is divided by scissors, as shown in Fig. 847, and the two recti muscles are brought together in

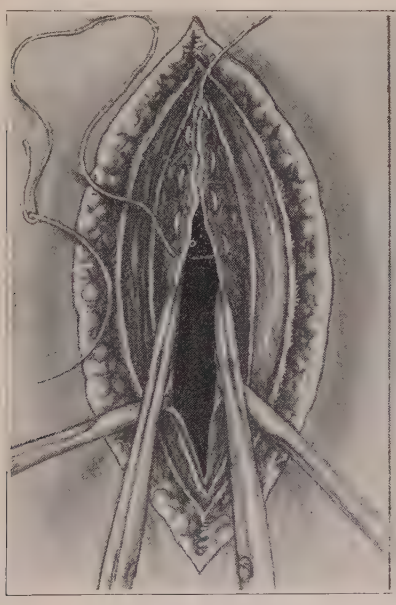

Fig. 846.

Fig. 847.

Fig. 846. Closing the abdominal incision. The peritoneum is being closed with a running catgut suture, with a large needle that may be used without a needle-holder. The continuous mattress suture prevents the raw edge turning in.

Fig. 847. Splitting the intermuscular septum so as to permit approximation of the two recti muscles. The peritoneum has been closed with the running mattress suture.

the median line by a loosely-drawn running suture. The peritoneal and muscular suturing may be conveniently made with the same suture, by suturing down the peritoneum, as shown in Figs. 846 and 847, and up in the muscles, as shown in Figs. 848 and 849, tying the muscular portion to the upper end of the peritoneal portion, which has been left long for that purpose.

The silkworm-gut stay-sutures are placed so that they lie just under the aponeurosis and emerge on the skin surface about half an inch (1½ cm.) from the wound margin, as shown in Fig. 849. Three are usually sufficient, except in the

very long incisions, where four or five may be required. The stay-sutures prevent undue tension on the line of union during muscular activity involving the abdominal wall. After several days the catgut sutures become somewhat softened and a sudden strain on the wall, such as coughing or sneezing, may damage the union by causing separation at spots deep in the depth of the wound or by causing the whole wound to open. This danger, the reality of which has been established by unfortunate experiences, is minimized by the use of stay-sutures, followed immediately on their removal by strong adhesive strapping (Fig. 873) which is to be maintained until the end of the fourth week. In that way adequate support supplements the approximation sutures until the union is firm enough to stand all strains to which it is likely to be subjected.

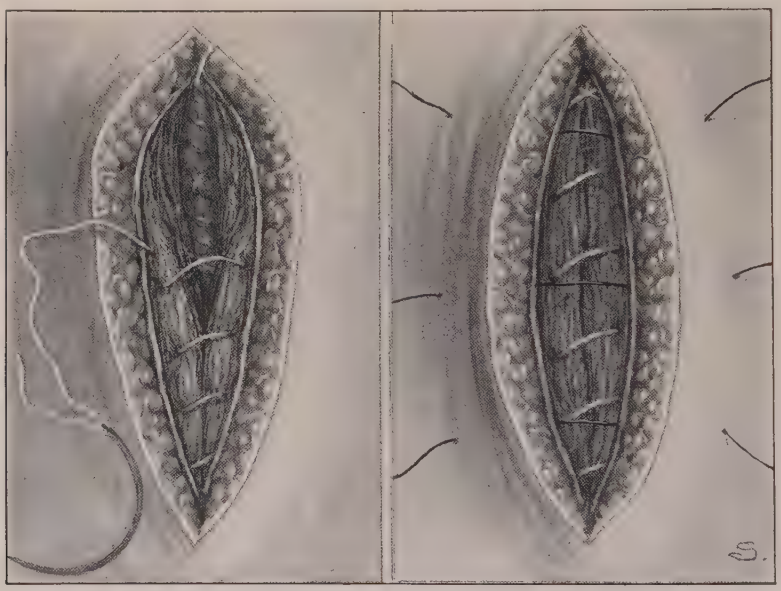

Fig. 848. Fig. 849.

Fig. 848. Approximating the recti muscles in the median line. For this purpose the remaining portion of the peritoneal suture may be used, the two ends being finally tied together as shown in Fig. 849. The musculo-approximation sutures should not be drawn tight. Light approximation only is desired, and injurious constriction must be avoided.

Fig. 849. Showing the tension sutures of silkworm-gut. These pass just under the aponeurosis, and are most conveniently placed at this stage of the suturing. If passed after the aponeurosis has been sutured, the needle may cut the aponeurotic suture at some point.

Next the aponeurotic edges are united accurately and securely (Figs. 850 and 851). This may be accomplished by a continuous suture locked at intervals, as shown in Fig. 851, or interrupted mattress sutures may be used. The suture material is of importance. It must hold long enough to permit firm union, for on this line of union largely depends the integrity of the scar and the prevention of hernia. Chromic catgut is generally used. Kangaroo tendon has been employed to some extent. A considerable number of operators prefer silk or linen,

and an occasional one pins his faith to silkworm-gut or silver wire. The non-absorbable sutures hold indefinitely, but if any infection takes place, sinuses are likely to persist until the infected sutures are removed. Such unpleasant experiences were common in former times when silk was the universal suture material. The ideal material is a dependable long-lasting absorbable suture. The author for several years has used 40-day catgut with entire satisfaction. The matter of suture material for the abdominal wound is considered in more detail under preparation of instruments and sutures (Figs. 811 and 812).

An additional measure to prevent post-operative hernia, is to overlap the aponeurosis as indicated in Figs. 852 and 853. This is especially useful in patients having an overstretched abdominal wall, with poor recti muscles.

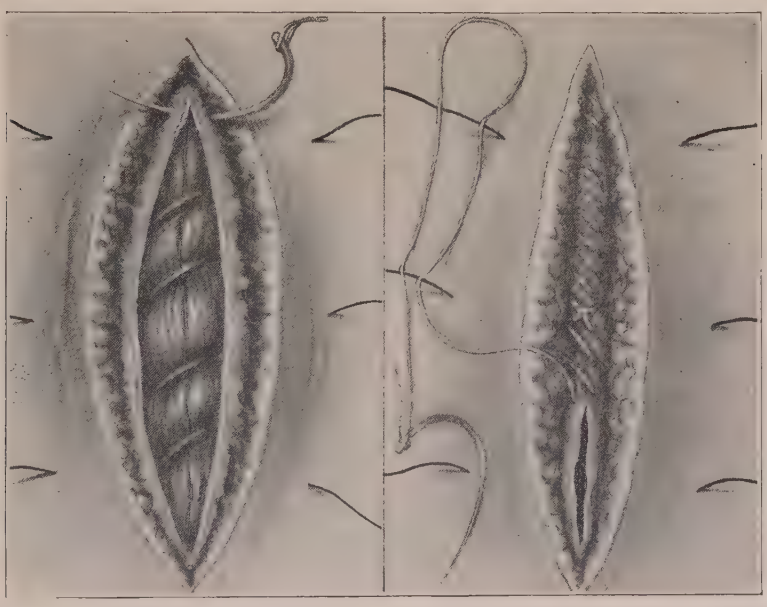

Fig. 850. Fig. 851.

Fig. 850. Beginning the suturing of the aponeurotic layer of the wall. The accurate closure of this layer is the best guaranty against hernia, though the author considers the approximation of the recti muscles between the peritoneal and aponeurotic suture-lines also an important item. The suture for the aponeurosis is of 40-day catgut and is passed with a large needle that may be used without a needle-holder.

Fig. 851. The aponeurotic suture almost completed. It is well to lock the suture occasionally, as explained in Fig. 262, thus converting it into a series of short continuous sutures.

An abdominal wall presenting wide separation of the muscles (diastasis) requires special care in closing. More difficulty is experienced in exposing the recti muscles and bringing them together, but it is especially important to do so thoroughly in such a case. The excess of aponeurosis may be disposed of by overlapping, as just explained, thus further strengthening the wall, or, if thought preferable, it may be excised.

The method of skin approximation varies greatly with different operators.

The skin wound may be closed by an ordinary continuous suture of catgut or silk or linen or by interrupted sutures of the same. The catgut may be placed in the form of a subcuticular suture, as explained later, or nonabsorbable material, such as silkworm-gut or silver wire or paraffined linen, may be used for such a suture, to be drawn out after healing. Some operators prefer clips for closing the wound, and others depend on adhesive plaster approximation of the skin margins.

After considerable experimentation with various methods of skin closure, the author has returned to the continuous catgut sutures, applied with the locked stitch as shown in Fig. 854. The fine suture (No. 0) is of plain catgut and

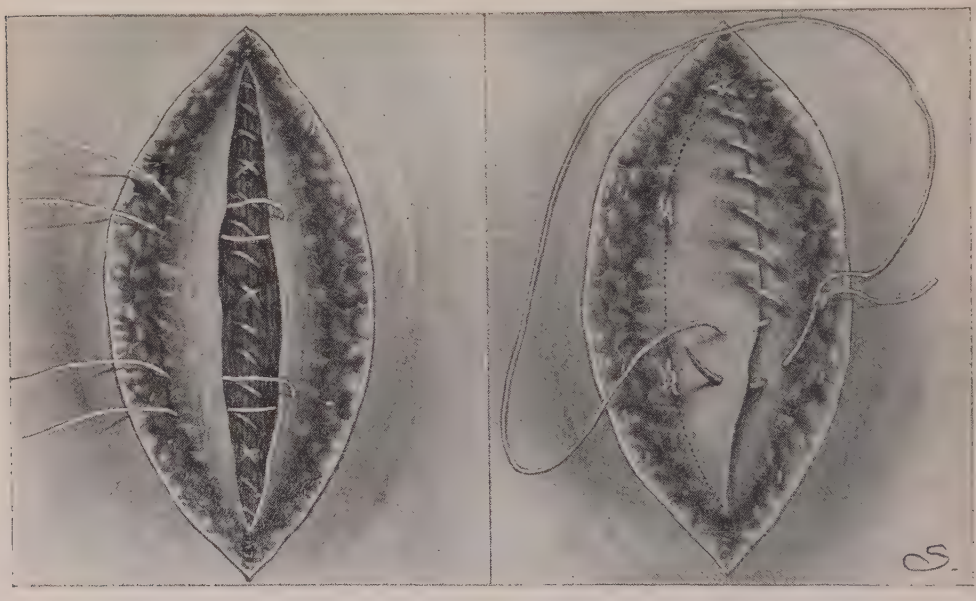

Fig. 852. Fig. 853.

Figs. 852 and 853. Overlapping the Aponeurosis. This is advisable in patients in which hernia is most likely to occur, such as stout patients with poor recti muscles and patients with lax or thinned-out abdominal walls.

Fig. 852. The method of drawing one layer of the aponeurosis under the other. Two to four sutures, depending on the length of the incision, are placed as here indicated. When tied they draw the aponeurosis of the left side under the aponeurosis of the right side and fasten it there securely.

Fig. 853. Sewing the upper layer of the aponeurosis well over on the under layer. The suture is of 40-day catgut and may be placed with a large needle without a needle-holder or with a small needle with a needle-holder, as preferred.

hence is absorbed almost as soon as its usefulness is ended. It does not have to be "removed" with forceps and scissors. The outer loose unabsorbed portion is simply brushed off. This suture is most expeditiously applied with a slender sharp needle, large enough to be handled conveniently without a needle-holder. The needle may be straight or curved, as preferred. The method of its applica-

tion is shown in Fig. 854 and the completed suture in Fig. 855. It can be applied rapidly, gives firm approximation, controls oozing in the flaps and is suitable for all conditions.

The subcuticular suture is applied as shown in Figs. 856 to 857. Fig. 856 shows how the suture is begun. Figs. 857 shows the details with the suture half completed. Fig. 858, A and B, shows the method of fastening the end. Catgut is usually used for this. However, a strand of nonabsorbable material may be used if preferred, the strand to be drawn tense at the close of the suturing and to be drawn out of the wound as soon as the skin union has taken place.

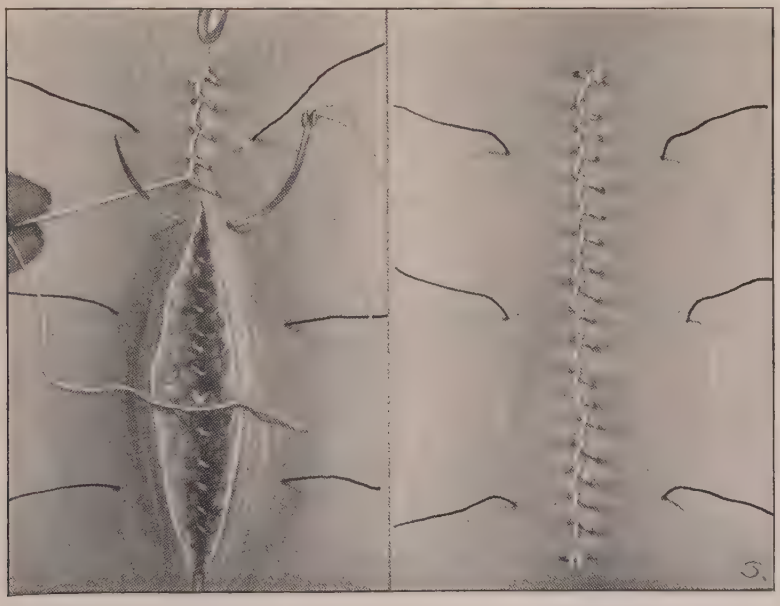

Fig. 854. Fig. 855.

Figs. 854 and 855. Closing the skin wound with plain catgut, using a half-locked suture. This suture is most conveniently placed with a large needle that may be used without a needle-holder. The needle should be slender and very sharp, and may be curved or straight, as preferred.

The half-locked suture checks oozing and approximates the skin edges better than the plain suture ordinarily. However, when the skin is very lax the plain suture is better than the locked. The locked suture doubles up the lax skin too much.

Transverse incision. Closure of a transverse incision follows the same general principles, except that stay-sutures are not required. The peritoneum is closed by the continuous catgut suture and the recti muscles may be approximated with the other half of the suture, as in suturing the regular longitudinal incision. The upper and lower margins of the divided aponeurosis are now securely approximated by the chromic catgut suture, and the skin is closed by whatever method preferred.

6. Dressing.

The skin about the wound is cleansed with an antiseptic solution and then dried. A sterile gauze dressing, consisting of one long roll (Fig. 859) or two small rolls making the proper width (Fig. 860), is placed on the wound and over this the stay-sutures or tension-sutures are tied as shown in the two illustrations. This method of securing the dressing has a two-fold advantage. First, it keeps the dressing applied to the wound securely and evenly and without any slipping about. In the absence of some such device, the dressing not infrequently slips up, at times exposing the lower end of the wound. Second, it prevents the stay-sutures from cutting towards the center by pressure necrosis. To secure this effect the roll must be thick enough to make the tension on the suture straight up

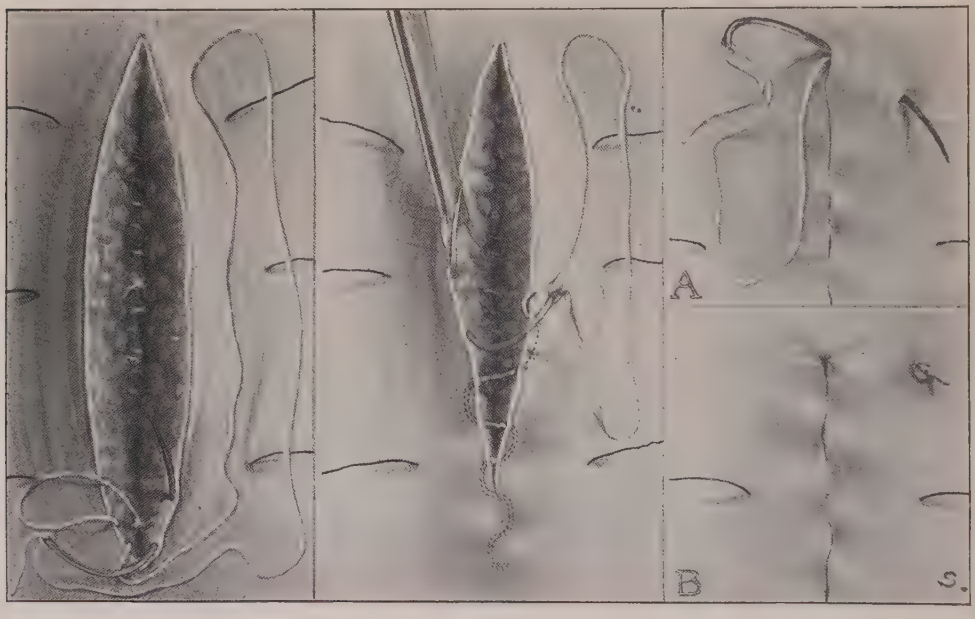

Fig. 856. Fig. 857. Fig. 858.

Figs. 856, 857 and 858. Closing the skin wound by Subcuticular Suture. The method of starting, continuing and completing the suture are all shown here. The suture makes a very neat-looking wound.

Compared with the ordinary suture, however, the subcuticular suture takes longer to pass, does not control oozing so well and is less certain to give satisfactory approximation in hurried closing. After trying various methods of skin closure, the author has come back to the ordinary suture, shown in Figs. 854 and 855, with or without locking, as best suited to the particular case.

instead of toward the center. This point is illustrated in Fig. 861. When the roll is of proper width, as in Fig. 861,A, the sides of the sutures as they pass through the skin pull straight up, and there is no tendency to cut toward the median line. Sutures so placed may be left in position ten days or two weeks without the pressure necrosis above mentioned. In Fig. 861,B, the roll is too small and the tension toward the median line will cause the sutures to begin, after a few days, to cut inward from each side. When drainage is used, the stay

sutures are tied through rubber tubing. For each suture a piece of tubing is cut, just long enough to span the space between the entrance and exit of the suture, and this piece is threaded on the suture before it is tied.

If preferred, the silver foil dressing may be used, with or without the rolls.

Next come the gauze, cotton and binder of the ordinary dressing. If the tied-on roll has not been used, then the main part of the dressing should be held firmly in place by wide adhesive strips.

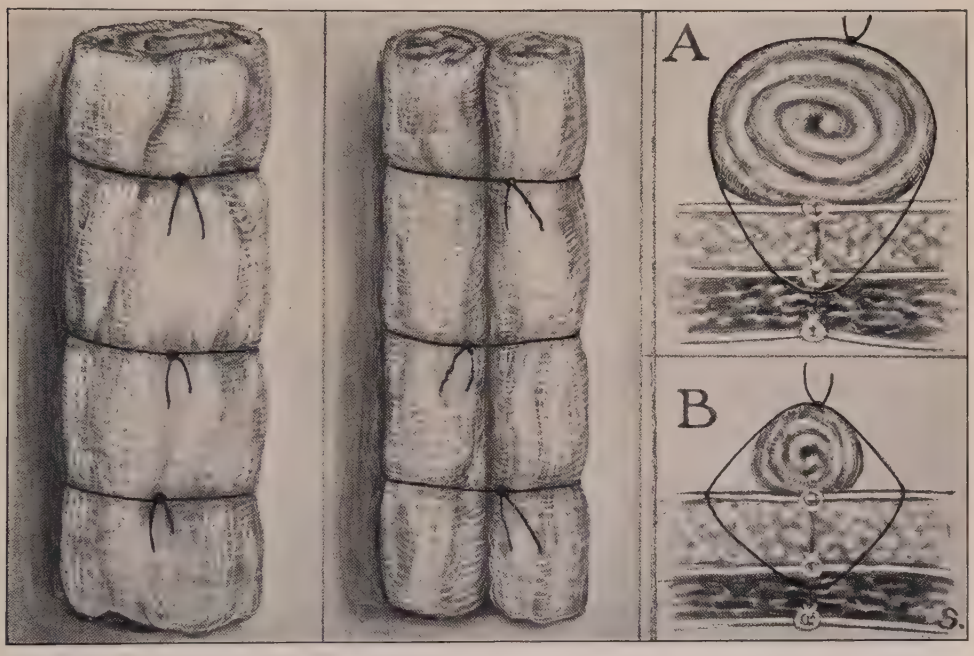

Fig. 859. Fig. 860. Fig. 861.

Figs. 859, 860 and 861. The Tied-on Dressing. Many years ago the author saw this expedient used by the late Henry H. Mudd, and in all the changes in wound dressing that have since come to pass, he has found nothing that was equal to it as a simple, satisfactory and entirely dependable dressing for a clean abdominal wound.

One roll may be used, as in Fig. 859, or two rolls, as in Fig. 860. The important point is that, whether one or two rolls are employed, the amount of gauze within the grasp of the tension sutures should be wide enough, as in Fig. 861a, to keep the suture from cutting toward the median line. When the roll is small, as in Fig. 861b, the smallness of the roll permits the tension sutures to gradually cut through the skin towards the median line—and thus one of the advantages of the "tied-on roll" is lost.

SPECIAL POINTS.

There are a number of special points that must be given consideration by every one doing abdominal surgery. Among these may be mentioned the following:

1. Drainage.
2. Shock.
3. Injury to adjacent organs.
4. Foreign bodies left in abdomen.
5. Excision of fat from abdominal wall.

1. Drainage.

The rule in abdominal surgery is not to drain unless there is some special reason for it. Experience has abundantly shown that in all but exceptional cases the best results are obtained by closing the peritoneal cavity completely and leaving nature to carry on the reparative process alone, undisturbed by tubes, gauze or other form of drainage.

Indications. That small percentage of cases in which drainage is advisable includes the following classes:

a. Rapidly spreading inflammation of the peritoneum or acute general peritonitis. In such cases free drainage is indicated, and as a rule the freer the better.

b. Rupture of abscess in pelvis. This accident happens not infrequently during the enucleation of an inflammatory mass containing pus. In some cases the pus is not confined in any removable sac, but has burrowed in various directions among the adherent organs. In such a case as soon as the adhesions are separated the pus flows out into the peritoneal cavity.

c. Persistent free oozing from surfaces left after the enucleation of an inflammatory mass. Here the effect desired is pressure rather than drainage, but, as the end of the gauze used for pressure must be brought out through the abdominal wound or through the vagina, it is usually referred to as a drain or pack.

d. Endometrial ovarian cysts with extensive adhesions.

Methods. The method of draining depends somewhat on the extent of the inflammation and other conditions present. If the inflammation is limited to the true pelvis and hysterectomy has been performed, *vaginal drainage* is the preferable plan. If the cervix uteri has been removed, there is already a satisfactory opening into the vagina. If the cervix has not been removed, it may be split posteriorly, as shown in Figs. 407 and 408. If the inflammation is chronic and only a safety vent is required, gauze or rolled rubber dam may be used. This preserves an opening into the suspicious area which may be made available for drainage any time serious symptoms occur in the next few days, by simply removing the plug. If the inflammation is acute, immediate drainage should be provided for by using good-sized rubber tubing (Fig. 623). The gauze packing beside the tubing should be placed so that it may be removed without disturbing the drainage tube.

If the inflammation is severe and extensive, drainage both above and below may be advisable—the *abdominal drainage* being by means of a hard rubber or soft rubber tube (Fig. 813). If the uterus is preserved, it is usually preferable to drain above only, though vaginal drainage through a special opening in the vaginal vault may be employed if desired.

When a *firm tube* is left extending into the pelvis for drainage, a large piece of sterile sheet-rubber is usually slipped over the end of the tube (Fig. 862) to

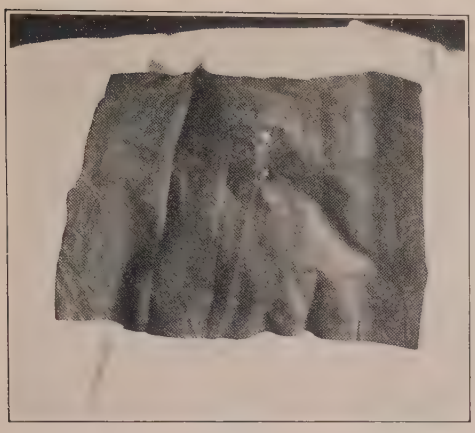

Fig. 862.

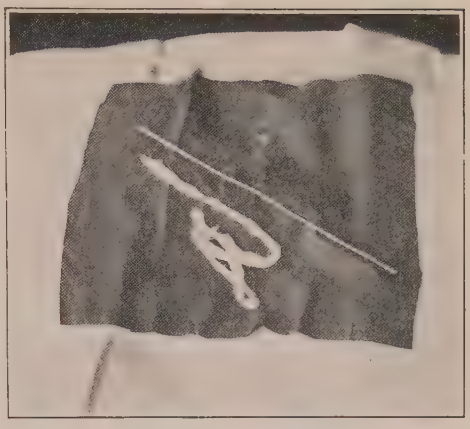

Fig. 863.

Fig. 862. Dressing the Drainage Tube. The piece of sheet-rubber punctured and slipped over the end of the tube.

Fig. 863. Dressing the Drainage Tube. The gauze wick and applicator for emptying the tube. After the tube is emptied, a gauze wick is left in it to assist drainage.

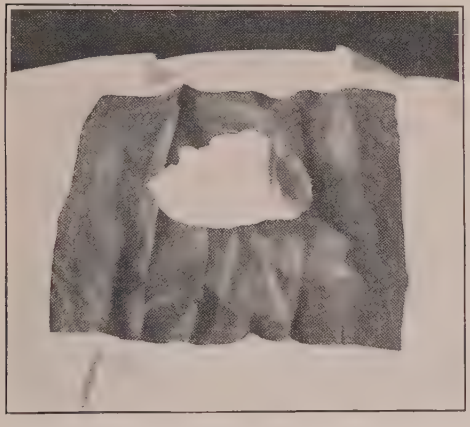

Fig. 864.

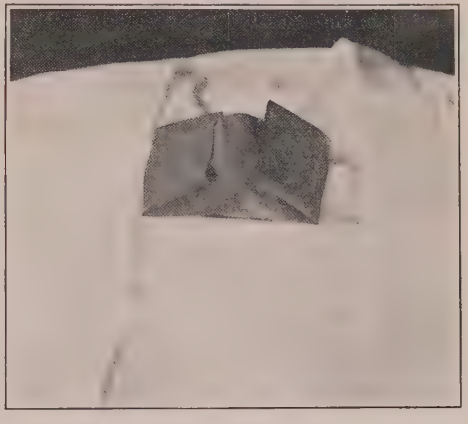

Fig. 865.

Fig. 864. Dressing the Drainage Tube. Gauze pieces arranged about the end of the tube, to absorb the discharge.

Fig. 865. Dressing the Drainage Tube. The sheet-rubber folded over, to inclose the gauze about the end of the tube and thus protect the general dressing.

keep the fluid that comes out of the tube from soiling the gauze on the abdominal wound. A small wick of twisted gauze (Fig. 863) is then passed to the bottom of the wound to aid in the drainage. This twisted wick should be small enough to leave plenty of room around it inside the tube to permit the discharge to come out. Some pieces of gauze are now placed over the end of the tube (Fig. 864) and the piece of sheet-rubber is folded over the gauze from all sides (Fig. 865). The whole is then covered with a large piece of sterile cotton and the binder applied, taking care to avoid pressure on the tube.

2. Shock.

The principal factors in shock are (a) loss of blood, (b) exposure and handling of abdominal contents and (c) long anesthesia. To avoid shock, therefore, particular attention must be given to the following points:

a. Careful hemostasis. All vessels that can be located are ligated or clamped before they are divided. In cutting through ligated tissues, forceps are in readiness to catch any vessels that may have escaped the ligature or upon which the ligature is not tight enough.

b. Protection of the abdominal contents, as far as possible, from handling and exposure. The Trendelenburg posture accomplishes this to a large extent. In this posture the intestines and omentum gravitate into the upper part of the abdominal cavity away from the field of operation. Those parts that still tend to protrude into the pelvis are held out of the way by gauze, which, at the same time, serves to wall off the pelvis from the abdominal cavity. When the intestines are unavoidably permitted outside of the peritoneal cavity, they should be kept covered with large sterile towels soaked in hot saline solution.

c. Minimum duration of anesthesia. To cut down the duration of the operation and consequently of the anesthesia, the operator should work rapidly—as rapidly as is consistent with safety and accuracy—but accuracy must not be sacrificed to haste.

There are other items to be considered in the prevention or limitation of shock. The preliminary preparation of the patient is of importance in that it puts the kidneys and heart and nervous system in better condition to stand the extra nervous strain. The confidence inspired by the physician and the nurses and the quiet, orderly regime of the hospital is also helpful. The preanesthetic sedative calms the nervous system and prevents undue excitement during the trip to the operating room and the beginning of anesthesia.

In this category belongs also the use of local anesthesia, in association with general anesthesia, to diminish the conductivity of the sensory nerves from the site of operation, on the supposition that, even with the patient anesthetized, there are impulses along these nerves that tend to exhaust the vital centers. This constitutes the "anoci-association" about which so much has been written by Crile and others. The theory and technique are given in text-books on anesthesia. It remains to be seen whether, in general use, this complicated process of anesthesia and analgesia will be productive of more good than harm.

3. Injury to adjacent Organs.

The ureters, the bladder and the intestines are the organs particularly liable to injury in difficult cases. Ordinarily an injury of any of these organs occurring in the course of an operation must be repaired at once or at the close of the operation, and anyone doing pelvic surgery must be prepared to immediately take care of the injuries mentioned.

Injuries to the bladder and ureters occur particularly in connection with the radical operation for cancer of the cervix uteri and hence are considered in that chapter (Figs. 549 to 566).

4. Foreign Bodies Left in the Abdomen.

The absolute certainty of the removal of all articles carried into the peritoneal cavity is a subject that deserves most careful consideration. It is surprising how easily and quickly the intestinal coils will enfold an object and carry it out of sight and touch. The articles that have caused most trouble in this respect are sponges and forceps.

Sponges. A sponge left in the peritoneal cavity following an operation constitutes one of the most deplorable accidents of abdominal surgery. This is not a new subject. Much has been written upon it and many cases have been reported and many suggestions have been made as to preventive measures. But all such measures hitherto* proposed have broken down under the various circumstances and vicissitudes of surgical work, as evidenced by the records subsequently cited. In connection with this subject the author wishes to call attention to the following facts:

1. Sponges are lost in the peritoneal cavity much more frequently than is generally supposed. The accompanying table of reported cases will indicate the importance of the subject. And it must be kept in mind that the reported cases represent only a small portion of the recognized cases, for naturally, the accident is not given publicity except where there is some special reason for doing so. In any large body of surgeons a little experience meeting, in which testimonies are freely given, will bring to light a number of unreported cases of this accident.

Furthermore, many cases are not even recognized. The patient dies with evidence of peritonitis; there is no suspicion of any foreign body having been left in the abdomen, no post-mortem examination is made and the death is supposed to be due to ordinary peritonitis. The possibilities in this direction are indicated by the fact that, in the series mentioned, in thirty-nine of the cases the accident was recognized only on post-mortem examination, when the sponge was found, but would have remained unknown had there been no autopsy.

2. It is a most serious accident. In the large series of cases collected, more than one-fourth of the patients died, and of those who recovered many went through weeks and months of suffering.

3. To persons outside the profession the accident seems absolutely inexcusable. They can understand how other complications may arise, such as hemorrhage or sepsis or kidney failure, in spite of every precaution, but they can imagine no reasonable excuse for allowing a sponge to be lost in the patient's interior. To those not familiar with surgical work it seems past belief that the

*Before 1909. This text is largely taken from the author's paper (Am. Jour. Obstet., 1909, Vol. 59), in which the subject was considered in detail and a new and effective method described.

surgeon would carry into the peritoneal cavity anything the removal of which was not provided for with absolute certainty.

The growing cognizance of the public in regard to the occurrence of this accident and the feeling in regard to the responsibility for it are reflected in the increasing number of lawsuits connected therewith.

4. There has hitherto been no sure preventive method which was applicable in all the varied circumstances of abdominal surgery. The list of preventive measures recorded shows that much thought has been given to devising means for preventing this accident. Rules interminable have been proposed, and expensive and cumbersome racks and stands devised for the purpose. Not one of these devices, however, has proved absolutely safe, for the reason that in their use the certain removal of all sponges carried into the abdomen depends on the studied attention of the operator or on a system of attentive coöperation among assistants or nurses. While such attentive coöperation is entirely feasible under ideal conditions and with ideal persons, the fact remains that it is not secured and is not likely to be secured under the variable circumstances of abdominal work. The many emergencies which arise in the course of abdominal operations, the changing assistants and nurses, the hurried operations at night in the hospital with short help, the operations in private homes where the patient cannot be gotten to the hospital at all—all these conditions play havoc with safety arrangements depending upon a nicely-balanced system of rules and coöperation or on the use of cumbersome racks or stands.

There is not space here to take up in detail the various ways in which mistakes have occurred; suffice it to say that a review of the cases where dependence was placed on counting shows an appalling list in which a sponge was left, because one was hastily torn in two and one-half forgotten or an extra one was primarily included in the bundle and missed in the counting or an extra one was secured for an emergency during the operation or some loose piece of gauze, not intended for intraperitoneal use, slipped in while near the wound or a mistake was made in the final count of the sponges removed. It is astonishing what a slight inattention may lead to a sponge being left, and the consequent death of the patient.

The method of attaching a tape to each sponge and then fastening a forceps to the tape and at the same time to the abdominal sheet, is the method probably in most general use. It has a record of many accidents—the tape pulled off the sponge or there was a failure to attach the forceps or the forceps failed to hold well. In one recorded case the sponge and tape and forceps were all lost in the cavity.

The difficulty of guarding absolutely against leaving a sponge in the abdomen is such that entire security against this fatal accident is counted one of the unsolved problems of abdominal work. Practically all writers on the subject state that there is no guaranty against its occurrence, even in routine hospital work and with all the rules of coöperation and the special apparatus designed to pre-

vent it. Neugebauer, in a most exhaustive consideration of the subject, comes to the conclusion that the accident is, to a certain extent, unavoidable. Schachner, in an excellent paper, states, "So long as surgery continues an art, just so long will foreign bodies continue to be unintentionally left in the abdominal cavity." Findley states, "In former years the abdominal surgeon was seriously disturbed by well-grounded fears of secondary hemorrhage and sepsis, but surgery has mastered these problems to a large degree and they are little feared and seldom experienced. Now it is the thoughts of the sponge that disturb the night's repose when the report comes that something has gone wrong with our patient. The operator never can rid himself of the feeling of uncertainty as to the possibility of leaving a sponge." This expresses very well the feeling of those who have given attention to this subject and particularly of those who have personally experienced the accident and have thus been brought face to face with a concrete exemplification of the inadequacy of the usual methods.

The continued occurrence of this fatal accident and the failure of the preventive methods in general use constitute sufficient reason for calling attention to a method which the author has used with much satisfaction for several years. This method gives entire security and at the same time is simple and inexpensive, and is effective in all conditions of abdominal work—in the emergency operation in the country with unfamiliar assistants, as well as in the routine hospital work. The failure of the safety methods in general use is due to their dependence upon sustained attention concerning the sponges, which attention on the part of the surgeon cannot be given to the sponges, for it is required elsewhere. A method, to be effective under all circumstances, must be practically *automatic,* insuring the removal of all gauze without particular attention on the part of anyone at the time of the operation.

The Method.

The underlying principle of this method is the elimination of all detached pads and sponges. In place of them long strips of gauze are used, each strip being packed into a small bag in such a way that it may be drawn out a little at a time as needed.

The author was led to a study of the subject and the adoption of this method by an unfortunate experience. Following the usual technique, he operated for years without accident, but finally some years ago he left a gauze pad in the abdomen. The case was one of diffuse pelvic suppuration, requiring extensive drainage, and, fortunately, the pad was discovered and extracted through the drainage opening about two weeks later. The patient recovered without serious result from the accident—but the lesson was not lost. The author determined to find some method that would really prevent such an accident—a method which would be entirely under the control of the operator and first assistant (a greater division of responsibility increases the danger) and one which would occasion no delay in the closing steps of the operation.

There had to be taken into consideration the large pads for holding the intestines out of the way and the small pads and gauze pieces for sponging.

It was imperative to find some method that would do away entirely with dependence on the counting of the sponges at the close of the operation. As long as there was dependence on counting of the numerous small pads and sponges there would be mistakes, and consequently sponges would occasionally be left in the cavity. To eliminate this hazardous dependence on counting, and to provide a method that would make the leaving of a sponge in the abdomen practically impossible, was not an easy task. The problem was worked over for the greater part of a year. Various methods in common use for keeping track of the small pads and sponges were tried, such as clamping an artery forceps to a tape attached to each sponge, attaching a heavy ring to each tape before sterilization, clamping each tape or a corner of each sponge to the sterile sheet about the wound, and so on. But no method was found that was practical under all circumstances and absolutely safe.

It then became evident that if safety were to be secured, the detached pads and sponges must be eliminated entirely. In pursuance of that idea the author devised the method here described.* The object of the method is to make the removal of all sponges automatic, and therefore independent of sponge counting and other uncertain procedures. The essential feature of this method is the substitution of a long gauze strip for the ordinary detached sponges, the greater part of the strip being always outside the abdominal cavity. The strip is 10 yards long. Two strips are made by dividing the yard-width of gauze in the center and folding each half longitudinally to six thicknesses. Each strip is therefore 10 yards long, about 3 inches wide, and has six thicknesses of gauze. For protection and convenience in handling, the strip is packed into a small muslin bag, 5 inches wide and 10 inches deep (Fig. 802). The end of the strip is stitched to the bottom of the bag, and the strip is then packed into the bag in such a way that it may be pulled out a little at a time, as needed (Fig. 803). The filled bags are sterilized and are then ready for use (Fig. 804). At operation, the bottom of the bag is clamped or pinned to the abdominal sheet, and the gauze strip is pulled out little at a time as needed for sponging (Figs. 805 to 808). Originally, I used a wide strip for packing back the intestines, in addition to the narrow strips for sponging.

Since the publication of the method in 1909, modifications in details have been made by several surgeons. One operator made pockets in the abdominal sheet for holding the strips. Another arranged a large bag for each side, and connected them by tapes across the median line, giving a "saddle bag" arrangement, which was very convenient for holding the strips before sponging, and also the soiled strips after sponging. Recently, in place of the wide strip for packing back the intestines, I have substituted sheet rubber, advocated for this purpose by several operators. Rubber sheeting for walling

*This description is taken from the author's last article on the subject—Chairman's Address, Section on Obstetrics, Gynecology and Abdominal Surgery at the Seventy-Fourth Annual Session of the American Medical Association, San Francisco, June, 1923 (Jour. A. M. A., Vol. 81, p. 1571).

off the intestines from the operative field has been found less irritating than gauze. Hence it tends to fewer adhesions and less vomiting and other post-operative peritoneal disturbances. Its advantages are emphasized by Keefe, in an article on abdominal sponging (Jour. A. M. A., Vol. 67, p. 567), and also by Bissell in an article on vomiting and distention after operation (Surg., Gynec. & Obstet., Vol. 35, p. 320). The author experimented with different sizes of rubber sheeting and different weights, and adopted for routine use a piece 24 x 36 inches of a very heavy pure gum rubber sheeting No. 20 gauge (Fig. 804). This size was found most convenient for all-round work in the pelvis and abdomen. In the large abdomen it may be used spread out and tucked far laterally to control the intestinal coils. In other cases it may be folded as needed to adjust it to the condition found, and in the small wound a corner of it may be used.

The arrangements for abdominal packing and sponging thus become very simple (Fig. 804). The intestines are packed away from the field with the rubber sheeting, and the sponging is done with the continuous strip sponge, which automatically removes all danger of a sponge being left (Fig. 809). The gauze strip sponges and bags are made with much less trouble than the numerous detached gauze pads and sponges of various sizes in general use. Nurses welcome the method, because it simplifies the preparations for abdominal operation and also eliminates the trying responsibility of sponge counting at the close of the operation.

For the exceptional condition in which "point" sponging is required, as in ureteral work deep in the pelvis or cholelithiasis involving the common duct, the usual "gauze-pointed forceps" (long forceps holding a very small gauze ball clamped securely in their tip) may be used. However, it is surprising how easily point sponging may be done with the strip, as familiarity with it and dexterity are acquired.

Of course, the use of the gauze strip sponge, like any other important change in technique, must be studied, and attention must be given to details in order to make it work smoothly. Various questions have been asked concerning the method by surgeons contemplating its use. The following points seem to be the only ones requiring any special directions:

(*a*) The strip should never be cut during the course of an operation, as that destroys the continuity of it and the certainty of the removal of all pieces.

(*b*) In picking up a portion of the strip for sponging, enough should be drawn out of the bag to permit the portion in the forceps to be carried easily and without tension to the farthest area to be sponged (Fig. 805).

(*c*) The used folds of gauze should not be permitted to accumulate in the vicinity of the wound, but should be allowed to promptly gravitate outside the operative field (Figs. 806 to 808).

(*d*) When there are many forceps in the abdominal wound, an assistant should hold the handles out of the way sufficiently to give room for the continuous sponge to be carried in and out without entangling (Figs. 807 and

808). The assistant's hand laid over the group of forceps prevents their becoming entangled with the sponges or with the sutures.

This method eliminates all chance of leaving a sponge in the abdomen, for the larger part of the strip is always outside the cavity, and the end is fastened securely outside. The important point is that the sure removal of gauze is *automatic*. It does not depend on the accuracy of a hurried counting of sponges at the close of the operation, or on catching each sponge or sponge-tape with forceps, or on a studied "watching what sponges go in and what sponges come out of the cavity." Those methods that depend for safety on the observance of complicated rules or on the strict following of a regular routine or on the constant attention of the operator have all broken down under the difficulties and vicissitudes of abdominal surgery, as the many reported cases clearly show. Notwithstanding the various methods in common use, lives are still being sacrificed to this accident. In spite of widespread interest in the subject for some years past and of much study and investigation of it and several excellent papers by different authorities, there has been no signal advance in general practice. Ten years ago, operators were using the same preventive methods now commonly employed. The sponges were counted, tapes were attached to the sponges that were counted, forceps were attached to the tapes that were attached to sponges that were counted, and so on and so on. Yet with all these complicated precautions, many sponges are still being left in the cavity. Two hundred reported cases of this accident and new cases coming in right along constitute a startling commentary on the inefficiency of the safety precautions in common use.

The dangers from hemorrhage and sepsis in clean cases have been largely done away with through improvements in technique, and now this other serious menace in abdominal work should be eliminated. The patient has a right to demand and is demanding, as many lawsuits show, that *real protection* be afforded against leaving a sponge in the abdomen. It seems only justice to those who intrust themselves to our care that we should provide absolute security against this fatal accident, so far as such security is practically attainable.

A method to be really safe and suitable for general use, must be (1) automatic in the removal of all gauze carried into the cavity; (2) comparatively inexpensive in materials and preparation; (3) fairly simple and convenient in use, and (4) applicable in every environment, including emergency work in the country. These four basic requirements are met by the method here described.

Forceps. In about one-fourth of the recorded cases of a foreign body left in the abdomen, the article left was a forceps or piece of an instrument or other small object used about the wound. This calls attention forcibly to the fact that small instruments should not be allowed about an open abdominal wound. Neugebauer long ago directed attention to this danger of small instruments, and urged the use of *long instruments* exclusively in abdominal work.

Many surgeons have adopted this safety measure, but there are many others

who seem to give no thought to the matter, and continue to use numerous small instruments in this dangerous locality. It may not be possible at present to entirely prevent the accident of leaving some article of the surgical armamentarium in the abdomen, but it is possible to reduce the danger to a minimum by the use of long instruments exclusively, and it seems that all those who are engaged in abdominal surgery should be led by common prudence to adopt this simple expedient. The details, as carried out in the author's work, are as follows: Every instrument used about the wound is long—so long that a portion of it is practically always outside the abdominal cavity. Again, if by accident such an instrument should slip entirely into the cavity, its length is such that it would almost certainly be felt when the hand is carried into the cavity for the final palpation before closing. All the artery-forceps, dissecting-forceps, tenaculum-forceps, pedicle-needles, scissors and other instruments for internal work, are from six and a half to eight inches long, the shortest being the large dissecting scissors (six and one-half inches). The shortest instrument used anywhere about the wound is the scalpel (six inches), which is laid aside as soon as the peritoneal cavity is open. The needles and Murphy buttons are not brought near the wound, except when held with a forceps or with a suture attached. No Michel clamps (for holding rubber tissue or gauze along the wound margin) or other small unattached objects are allowed near the wound as long as the peritoneal cavity is open.

The following table, giving a partial list of reported cases, will serve to call attention to the importance of the subject of foreign bodies left in the abdominal cavity at operation:

REPORTED CASES OF A FOREIGN BODY LOST IN THE ABDOMINAL CAVITY

ABDOMINAL SECTION. SPONGES LEFT.

No	Date of Report.	Operator*	Character of Operation.	Article Lost.	When and How Removed.	Result.
1	1859	Fehr.	?	Sea sponge.	Details not given. Mentioned by Fehr and quoted by Olshausen.	?
2	1877	?	?	Sea sponge.	Found at secondary operation by G. Braun. *c.*	?
3	1883	Lawson Tait.	?	Sponge.	Sponge missed. Four hours later wound was reopened and sponge recovered. *a.*	?
4	1884	H. P. Wilson.	Ovarian cyst and pregnancy.	Pieces of sea sponge.	Five months after operation, pieces passed through sinus in scar. *a.*	Recovery.
5	1884	T. G. Thomas.	Carcinoma of spleen.	Pieces of sea sponge.	Found at autopsy. Patient died four days after operation. Carcinoma inoperable. *a.*	Death.
6	1884	Howitz.	Uterine necrosis.	Sponge.	Found at autopsy. Details not given. Cited by Wilson. *a.*	Death.
7	1884	London Surgeon	?	Sponge.	Found at autopsy. Cited by W. T. Howard and also by Wilson. *a.*	Death.
8	1889	Bridden.	Myomectomy.	Sea sponge, 7 cm. wide.	Found at autopsy. Patient died sixth day of peritonitis. *c.*	Death.
9	1892	Pilate.	Hysterectomy.	Compress, 8 inches long.	Passed per rectum, nine months after operation. *a.*	Recovery.
10	1892	Salin.	Ovarian tumor.	Gauze napkin.	One year later, gauze removed through an abscess sinus, with subsequent fecal fistula which healed. *a.*	Recovery.
11	1892	French surgeon	Salpingitis.	Two strips of gauze.	Eight months later, 35 cm. strip of gauze extracted per vaginam, still later intestine resected and cm. strip found within. *a.*	Recovery.

ABDOMINAL SECTION. SPONGES LEFT.

No.	Date of Report	Operator*	Character of Operation.	Article Lost.	When and How Removed.	Result.
12	1892	French surgeon.	Uterine fibroid.	Compress, 26 cm long.	Eight months later passed per rectum, without alarming symptoms at any time. *a.*	Recovery.
13	1892	French surgeon.	Myomectomy.	Sponge.	A few hours after operation abdomen was reopened and sponge located and removed. *a.*	Recovery.
14	1892	Quinn.	Pyosalpinx	Napkin.	Found at autopsy. Was suspected. Death on third day with symptoms of severe dysentery. *a.*	Death.
15	1893	Terrier.	?	Sponge.	Found at autopsy. Death on third day from peritonitis. *a.*	Death.
16	1893	?	Hysterectomy.	Compress.	Secondary operation by Michaux for painful abdominal mass. Compress found within intestine.	Death.
17	1895	Elsner.	Fibroid and ovarian cyst.	Pad, 7x8 inches.	Six months later, passed per rectum. Progress of mass noted along course of colon in last month. *a.*	Recovery.
18	1896	MacLaren.	Ovarian cyst and retroversion.	Gauze sponge, 6x6 inches.	Ten days after operation, expelled from rectum. Secondary operation three months later for adhesions. *a.*	Recovery.
19	1896	?	?	Sea sponge.	Details not given. Two cases were observed by MacLaren at autopsy in New York Woman's Hospital.	Death.
20	1896	?	?	Sea sponge.	See preceding note.	Death.
21	1896	Severeano.	Ovarian sarcoma.	Two compresses, each 130x30 cm.	After some months, one compress was extracted from a persistent sinus, and three weeks later, the other. *a.*	Recovery.
22	1897	Tuholske.	?	Sponge.	One hour after operation, sponge missed. Abdomen reopened and sponge found and removed.	Recovery.
23	1897	?	?	Sponge.	Details not given. H. C. Coe states that in autopsy work he found a sponge in five cases. Death by sepsis in each. *a.*	Death.
24	1897	?	?	Sponge.	See preceding note. *a.*	Death.
25	1897	?	?	Sponge.	See preceding note. *a.*	Death.
26	1897	?	?	Sponge.	See preceding note. *a.*	Death.
27	1897	?	?	Sponge.	See preceding note. *a*	Death.
28	1897	?	?	Sponge.	Twelve years later, passed per rectum. Reported by Hefting. *a.*	Recovery.
29	1897	Linquist.	Tubal pregnancy.	Gauze compress.	Two months later, passed by rectum. *a.*	?
30	1897	McMurtry.	Ovarian cyst.	Flat sponge.	Sponge missed before patient recovered from anesthetic. Sutures clipped and sponge removed.	Recovery.
31	1897	R. B. Hall.	Appendicitis.	Sponge.	Four hours later, sponge missed. Abdomen reopened and sponge removed.	Recovery.
32	1898	Wiggin.	Secondary operation for silk ligature.	Compress.	Some weeks after operation, gauze strip was removed from a persistent sinus. Lawsuit. *c.*	Recovery.
33	1898	Schramm.	Hysterectomy.	Compress.	Four weeks later operated for a mass, which proved to be the compress. *a.*	Recovery.
34	1898	Leopold.	?	Compress.	Removed by secondary operation. Was near liver. *a.*	Recovery.
35	1898	?	Cesarean section.	Compress.	Found at autopsy by Olshausen. Caused fatal peritonitis. *a.*	Death.
36	1898	Brosin.	Bicornuate uterus.	Compress, 20 cm. long.	Six months later, expelled from a persistent sinus. *a.*	Recovery.
37	1898	Roesger.	Uterine fibroid.	Fragments of sea sponge.	After six months, particles discharged through a persistent sinus. *a.*	Recovery.
38	1898	Bolt.	Hysterectomy for fibroid.	Gauze sponge.	Several months later, secondary operation. Sponge found in intestine. Resection. Death from shock. *a.*	Death.
39	1898	Schroeder.	Oophorectomy.	Gauze sponge.	Secondary operation some months later for an abdominal mass. Sponge, in mass. *a.*	?
40	1898	?	?	Sponge.	Found at autopsy by Thiersch. *a.*	Death

ABDOMINAL SECTION. SPONGES LEFT.

No.	Date of Report.	Operator*	Character of Operation.	Article Lost.	When and How Removed.	Result.
41	1898	?	?	Sponge.	Boldt stated in 1898 that he knew of five unpublished cases (among colleagues) of foreign bodies left in abdomen. *a.*	?
42	1898	?	?	Sponge.	See preceding note of five cases (count three sponges, and two forceps). *a.*	?
43	1898	?	?	Sponge.	See preceding note. *a.*	?
44	1898	?	?	Sponge.	Boldt states that pathologist in New York Hospital found foreign body at autopsy in two cases (1 sponge, 1 forceps). *a.*	Death.
45	1898	?	?	Sponge.	Boldt cites two cases in which abdomen was immediately opened, and forgotten article removed (1 sponge, 1 forceps). *a.*	?
46	1898	Eckstein.	Ovarian cyst, twisted pedicle	Sponge, 20×40 cm.	Five weeks later extracted from sinus in scar. Count of sponges after operation stated "correct." *d.*	Recovery.
47	1899	Buschbeck.	Tubal pregnancy.	Large compress.	Two and one-half years later removed from sinus in scar. *a.*	Recovery.
48	1899	Meinert.	?	Mull compress.	Three weeks later, secondary operation for mass in right lower abdomen. Proved to be compress. *a.*	Recovery.
49	1899	Rehn.	Pyosalpinx.	Compress, 1 m. square.	Four months later secondary operation. Compress found within intestine. Resection of 40 cm. *a.*	Recovery.
50	1899	Kader.	Salpingitis.	Compress, size of handkerchief.	Sinus present for six months. Later the compress passed per rectum. Death from peritonitis. *c.*	Death.
51	1899	Busch.	Uterine fibroid.	Mull compress.	Two months later, passed per rectum, after much trouble. *a.*	Recovery.
52	1899	Fritsch.	?	Sponge.	One year later removed by secondary operation. Cited by Kayser. *c.*	Recovery.
53	1899	Fritsch.	?	Sponge.	No details given. Cited by Kayser. *c.*	?
54	1899	Fritsch.	?	Sponge.	Two years after removed by secondary operation. Cited by Kayser. *c.*	Recovery.
55	1899	Gillette.	Tubal pregnancy.	Sponge.	Eighteen months later, removed by secondary operation. Lawsuit.	Recovery.
56	1900	Merttens.	Pelvic suppuration.	Compress.	Five months later, operation for abdominal mass. Compress within intestine. Resection of intestine. *a.*	Recovery.
57	1900	Wunderlich.	Ovarian cyst.	Compress, 21×100 cm.	Three months later, compress was passed per rectum. *c.*	Recovery.
58	1900	Wunderlich.	Cystectomy.	Linen cloth.	Found at autopsy. Death on third day. No evidence of peritonitis. *d.*	Death.
59	1900	H. A. Kelly.	Pelvic suppuration.	Marine sponge.	Some days later, wound was reopened because of disturbance. Sponge found and removed. *c.*	Recovery.
60	1900	Kelly.	Ovarian cyst.	Large gauze pad	Two and a half months later, operation for abdominal mass. Mass contained sponge and abscess. *c.*	Recovery.
61	1900	Kelly.	Ovarian cyst and appendicitis.	Gauze pad.	Five days later, operation for fever and a mass. In mass was sponge and abscess. *c.*	Death.
62	1900	Assistant to Kelly.	Fibroid of abdominal wall.	Gauze, 360 gm. weight.	One month later, secondary operation for mass in abdomen. Contained sponge and abscess. *c.*	Recovery.
63	1900	?	?	Sponge.	Reeves Jackson described two cases in which a sponge was found at autopsy. *a.*	Death.
64	1900	?	?	Sponge.	See preceding note. *a.*	Death.
65	1900	Spencer Wells.	?	Sponge.	Sponge missed. Abdomen reopened next day and sponge found. *a.*	Recovery.
66	1900	Winkle.	Myomectomy.	Sponge.	Found at autopsy. Details not given. *a.*	Death.
67	1900	?	Wound of omentum.	Sponge.	Two weeks later, sponge was extracted from an abdominal sinus. *a.*	?

ABDOMINAL SECTION. SPONGES LEFT.

No.	Date of Report.	Operator*	Character of Operation.	Article Lost.	When and How Removed.	Result.
68	1900	?	?	Gauze napkin.	Found at autopsy by Kijweski. Details not given. *a.*	Death.
69	1900	?	?	Gauze.	Przewoski found gauze in cavity at three autopsies following abdominal section. *a.*	Death.
70	1900	?	?	Gauze.	See preceding note. *a.*	Death.
71	1900	?	?	Gauze.	See preceding note. *a.*	Death.
72	1900	Krasowski.	?	Sponge.	Prof. Krasowski was legally proceeded against for leaving a sponge in the abdomen. *a.*	?
73	1900	Frankenhauser.	Myomectomy.	Sponge.	Removed by secondary operation. Details not stated. *a.*	Recovery.
74	1900	Bier.	Tubal pregnancy.	Mull compress, 1x1½ m.	Six months later, secondary operation. Compress found within intestine. *c.*	Recovery.
75	1900	Bier.	Pelvic tuberculosis.	Gauze strip.	Long time afterward, gauze passed per rectum. *c.*	Recovery.
76	1900		Two laparotomies, pyosalpinx.	Iodoform gauze, 52x44 cm.	Secondary operation for intestinal obstruction by Chaput. Gauze found within intestine. Intestine incised. *c.*	Recovery.
77	1900	Atlee.	Ovariotomy.	Sponge.	Found at autopsy. At operation a sponge was torn in two by an assistant. *a.*	Death.
78	1900	Borysowicz.	Uterine fibroid.	Gauze sponge.	Three weeks later, sponge was passed per rectum. Lawsuit threatened. *a.*	?
79	1900	Karl Braun.	?	Sponge.	Found at autopsy. *a.*	Death.
80	1900	?	?	Sponge.	Found at autopsy. Reported by W. T. Bull. *a.*	Death.
81	1900	?	?	Gauze napkin.	Found in a secondary laparotomy by Dmochosky. *a.*	?
82	1900	George J. Englemann.	Ovarian cyst.	Small sponge.	Sponge missed at operation. Searched for carefully but not found. Found at autopsy four days later. a.	Death.
83	1901	Beck.	Fibroid and pyosalpinx.	Sponge.	One month later, sponge was extracted from abscess in scar.	Recovery.
84	1901	?	?	Sponge.	Sponge finally passed per rectum. Cited by Beck, who was called to see patient by Leusman.	?
85	1901	Everke.	Pyosalpinx.	Gauze compress.	Later recovered by secondary operation. Details not given. Law suit. *c.*	Recovery.
86	1901	Everke.	Cesarean section.	Napkin.	Found at autopsy. Death on fifth day from splanchnic irritation. No sepsis. *c.*	Death.
87	1901	Le Conte.	Tubercular peritonitis.	Gauze strip, 1 yd. wide and 5 ft. long.	Year later, strip removed from a persistent fecal fistula. Suggestion made that accident was beneficial to patient. *b. c.*	Recovery.
88	1901	M. D. Mann.	?	Flat sponge.	Removed next day. No harm resulted. *b. c.*	Recovery.
89	1901	?	?	Gauze pad.	Cited by M. D. Mann. *b. c.*	Death.
90	1901	?	?	Gauze pad.	Cited by M. D. Mann in his letter to Schachner. *b. c.*	Death.
91	1901	?	?	Gauze pad.	Some months later, pad was discharged through sinus in scar. Cited by M. D. Mann. *b. c.*	Recovery.
92	1901	H. C. Coe.	?	Large gauze pad.	Four weeks later, pad was felt under scar, and removed. *b. c.*	Recovery
93	1901	Coe.	?	Gauze sponge.	Particulars not given. *b. c.*	Recovery
94	1901	Coe.	?	Gauze pad.	Particulars not given. *b. c.*	Recovery
95	1901	Roberts.	Hysterectomy.	Sponge.	One week later, sponge was extracted from an abscess in the wound. *b. c.*	Recovery
96	1901	Roberts.	Pelvic inflammation.	Pad.	Found at autopsy by Irwin Abel', Death 78 hours after operation, with symptoms of ileus. *b. c.*	Death.
97	1901	F. W. Samuel.	Fibroid and pyosalpinx.	Flat sponge.	Found at autopsy. Death the third day, with symptoms of nephritis. *b. c.*	Death.
98	1901	H. Grant.	Gunshot wound of abdomen.	Two sponges.	Found at autopsy. Patient died a few hours after operation. *b. c.*	Death.
99	1901	T. S. Bullock.	Ventral hernia.	Gauze pad, 7x5 inches.	Eight days later, pad was extracted from a sinus in the wound. *b. c.*	Recovery

ABDOMINAL SECTION. SPONGES LEFT.

No.	Date of Report.	Operator*	Character of Operation.	Article Lost.	When and How Removed.	Result.
100	1901	?	Appendicitis.	Gauze pad.	Three weeks later pad appeared at drainage wound and was extracted, *b. c.*	Recovery.
101	1901	Weir.	Appendicitis.	Sponge.	Details not given. *b. c.*	Death.
102	1901	Weir ?	?	Gauze pad.	Removed in five days. Details not given. *b. c.*	Recovery.
103	1901	Weir.	?	Gauze pad.	Five months later, pad was removed. Details not given. *b. c.*	Recovery.
104	1901	?	?	Sponge.	In his letter to Schachner, Weir cites two cases in which he removed a sponge. *b.*	Death.
105	1901	?	?	Sponge.	See preceding note. *b.*	Death.
106	1901	R. Matas.	Appendicitis.	Iodoform-gauze strip.	Six months later, strip was extracted from a persistent sinus. *b. c.*	Recovery.
107	1901	G. R. Fowler.	?	Gauze pad.	In letter to Schachner, Fowler mentions three cases. Details not given. *b. c.*	?
108	1901	Fowler.	?	Gauze pad.	See preceding note. *b. c.*	?
109	1901	Fowler.	?	Gauze pad.	See preceding note. *b. c.*	?
110	1901	Vander Veer.	?	Sea sponge.	Patient died of peritonitis. *b. c.*	Death.
111	1901	Vander Veer.	Carcinoma of uterus.	Sponge.	One year later, secondary operation for recurrence of carcinoma. Sponge found. *b. c.*	?
112	1901	C. P. Noble.	?	Sea sponge.	Some weeks later secondary operation and sponge found. *b. c.*	?
113	1901	?	?	Two sponges.	Cited by J. B. Murphy. Details not given. *b. c.*	?
114	1901	?	?	Piece of gauze.	Cited by J. B. Murphy. *b. c.*	?
115	1901	E. Lewis.	?	Sponge.	Fourteen days later, sponge extracted from sinus in scar. *b. c.*	Recovery.
116	1901	A. MacLaren.	Appendicitis.	Piece of gauze.	Three weeks later, gauze was extracted from drainage tract. *b. c.*	Recovery.
117	1901	Gerster.	Inoperable carcinoma.	Iodoform packing.	Found at autopsy. Details not given. *b. c.*	Death.
118	1901	?	?	Gauze pad and attached clamp.	Cited by Frank Hartley. Details not given. *b. c.*	?
119	1901	B. C. Hirst.	?	Sponge.	Found at autopsy. Sponge torn in two by assistant. Sponges counted and reported "correct." *b. c.*	Death.
120	1901	?	?	Gauze pad.	After some weeks. secondary operation for fecal fistula. A few days later the sponge was passed per rectum. *b. c.*	?
121	1901	W. M. Polk.	?	Half of a sponge.	Sponge torn in two at operation. Details not given. *b. c.*	?
122	1901	?	Ectopic pregnancy.	Pad.	Later extracted from a persistent sinus in scar. Observed by A. J. Boyd. *b. c.*	Recovery.
123	1901	W. T. Bull.	Cholecystostomy.	Large flat sponge.	Five days later, discovered in drainage tract and removed. *b. c.*	Recovery.
124	1901	Baldwin.	?	Sponge.	Baldwin, of Columbus, Ohio, was made defendant in a lawsuit because of sponge left in abdomen. *b.*	?
125	1901	Munde.	Sarcoma of kidney. Laparotomy.	Towel, 1x2 feet.	Four weeks later removed from a suppurating sinus. *b. c.*	Recovery.
126	1901	Price.	?	Sponge.	Sponge missed soon after closing wound. Reopened and sponge removed. *b. c.*	Recovery.
127	1901	Price.	?	Sponge.	Similar to preceding case. Price cites two cases in his letter to Schachner. *b. c.*	Recovery.
128	1902	Russell.	Oophorectomy.	Lint sponge.	Six months later, secondary operation. Sponge removed from within intestine. *c.*	Recovery.
129	1902	Lindfors.	Extrauterine pregnancy.	Compress.	Later extracted from a pelvic abscess by vaginal incision. *c.*	Recovery.
130	1903	Kayser.	Postoperative hernia.	Gauze roll.	Two and a half months later, secondary operation. Gauze roll within intestine. Resection. *c.*	Recovery.
131	1903	Beckmann.	?	Napkin.	Beckmann stated that he had three cases in which napkin was lost in abdominal cavity.	?
132	1903	Beckmann.	?	Napkin.	See preceding note. No details given.	?

ABDOMINAL SECTION. SPONGES LEFT.

No.	Date of Report.	Operator*	Character of Operation.	Article Lost.	When and How Removed.	Result.
133	1903	Beckmann.	?	Napkin.	See preceding note. No details given.	?
134	1903	Fick.	Perityphilitis.	Cotton compress.	Secondary operation for fecal fistula. Sponge found within intestine. *c.*	Recovery.
135	1903	Gruning.	Uterine myoma.	Marley tampon.	Some weeks later, after pain in lower abdomen, tampon passed per rectum.	Recovery.
136	1903	Schaefer.	Myomectomy.	Gauze napkin.	Found at autopsy, two years later. Accompanied by intestinal necrosis. *c.*	Death.
137	1904	Ahfeld.	?	Gauze sponge.	Prof. Ahfeld was subjected to a lawsuit in 1903, because of a sponge left in the abdomen. *c.*	?
138	1904	Corson.	Ectopic pregnancy.	Sponge 18x36 inches.	Two and a half months later, sponge passed per rectum. *d.*	Recovery.
139	1904	?	Kidney operation Laparotomy.	Sponge, 1 m. long.	Forty-six days later, secondary operation for painful mass and ileus. Sponge within intestine. Resection. *d.*	Recovery.
140	1904	Reise.	Extrauterine pregnancy.	Sponge.	Ten months later, secondary operation for ovarian cyst and inflammation. Sponge found near sigmoid. d.	Recovery.
141	1904	Thorne.	Abdominal tumor.	Sponge.	After several months, secondary operation. Sponge found. Lawsuit. *d.*	Recovery.
142	1904	Winter.	Hysterectomy for fibroid.	Sponge.	Found at autopsy. Death three weeks after operation, of embolus. *d.*	Death.
143	1906	Waldo.	Hysterectomy for fibroid.	Towel.	Some weeks later was extracted through sinus in scar. Sponges counted and "correct." *d.*	Recovery.
144	1906	?	Salpingectomy.	Iodoform gauze strip.	Two years later, found at secondary operation. Cited by Waldo. *d.*	?
145	1906	Ward.	?	Sponge.	Later discharged per vaginam.	Recovery.
146	1906	Brothers.	Ectopic pregnancy.	Pad.	Six weeks later, pad protruded from opening in lower part of scar.	?
147	1906	Grandin.	?	Pad.	Two and a half years later, found encysted in the omentum.	Recovery.
148	1906	Grandin.	?	Towel, with hospital name on.	Three weeks later, secondary operation for mass under liver. Mass contained towel.	Recovery.
149	1906	Landau.	?	Sponge.	One and a half years later, operation by Amann for supposed fibroid. Proved to be a sponge. *d.*	Recovery.
150	1906	Landau.	Ovariotomy.	Napkin.	Eighteen weeks later, secondary operation for a fecal fistula. Sponge found. *d.*	Recovery.
151	1907	MacLaren.	Hysterectomy.	Sponge, 12 in. square.	Found at autopsy, up under the liver. Death on the fourth day.	Death.
152	1907	Crossen.	Pelvic suppuration.	Gauze pad.	Two weeks later, appeared in drainage tract and was extracted.	Recovery.
153	1907	d'Antona.	Carcinoma of liver.	Gauze napkin 40x70 cm.	Found at autopsy. Death in one month from carcinoma, peritonitis and adjacent pleuritis. Two lawsuits. *d.*	Death.
154	1907	Dobrucki.	Ovarian cyst.	Sponge.	Three weeks later extracted through sinus in scar. *d.*	Recovery.
155	1907	Janczewski.	Ovarian cyst and pyosalpinx.	Gauze napkin.	Twenty-one days later removed from abscess in wound. (Janczewski, assistant to Neugebauer.) *d.*	Recovery.
156	1907	Poten.	Myomectomy.	Sponge.	Found at autopsy. Death after six weeks from bronchitis. No peritonitis. *d.*	Death.
157	1907	Prochownick.	?	Sponge.	Sponge missed. Wound immediately reopened and sponge found. *d.*	Recovery.
158	1907	Russian operator.	?	Gauze compress.	No details. Reported by Neugebauer. Operator did not wish name given. *d.*	?

ABDOMINAL SECTION. SPONGES LEFT.

No.	Date of Report.	Operator*	Character of Operation.	Article Lost.	When and How Removed.	Result.
159	1907	Polish operator.	?	Gauze compress.	Details not given. Reported by Neugebauer. *d.*	?
160	1907	Sippel.	Broad ligament tumor.	Iodoform-gauze pack.	Six weeks later the gauze strip passed per rectum. *d.*	Recovery.
161	1907	Berlin operator.	Adnexal mass.	Gauze strip.	Later extracted from the bladder by W. Stuckel. *d.*	?
162	1907	L. Meyer.	Cesarean section.	Mull napkin.	Found at autopsy. Death on the fourth day of peritonitis. Sponges counted and "correct." *d.*	Death.
163	1908	?	?	Five-foot roll of gauze.	Some months later removed by secondary operation, which was witnessed by J. C. Morfit.	?
164	1908	?	Appendicitis.	Iodoform gauze, 1 sq. yd.	Found at secondary operation in Mount Sinai Hospital. Witnessed by M. G. Seelig.	Recovery.
165	1908	?	Appendicitis.	Piece of sea sponge.	Extracted from sinus at Mt. Sinai Hospital, in 1900, by M. G. Seelig.	Recovery.
166	1908	Schooler.	?	Pad, 16 in. sq.	Details not stated. Patient awarded $1500 damages by a jury.	Recovery.
167	1908	Hageboeck.	Appendicitis.	Sponge.	Abscess formation and death of patient. Three trials for $50,000 damages.	Death.
168	1908	Findley.	?	Strip of gauze, 5 ft. long.	Ten days later, found at secondary operation. Sponges counted and stated "correct," but one roll had been cut in two.	Recovery.
169	1908	?	Ovarian cysts (bilateral).	Two gauze pads.	Removed by secondary operation, six weeks later. Followed by fecal fistula, which finally healed.	Recovery.
170	1908	?	Pelvic tuberculosis.	Small sponge.	One year later, secondary operation for persistent sinus. Sponge found. Death from operation.	Death.
171	1908	?	Gallstone operation.	Small sponge.	Found at autopsy. Death after four days from peritonitis.	Death.
172	1908	Rieck.	Extrauterine pregnancy.	Compress, 15x20 cm.	No symptoms. Four months after operation, compress passed per rectum.	Recovery.

ABDOMINAL SECTION. FORCEPS AND OTHER ARTICLES LEFT.

173	1880	Mariani.	Ovariotomy.	Drainage tube.	Drainage tube slipped inside and was overlooked. One week later it passed per rectum. *a.*	?
174	1886	Oltshausen.	Ovariotomy.	Forceps.	Ten months later, passed per rectum, after only two weeks disturbance. *a.*	Recovery.
175	1892	French surgeon.	?	Forceps.	Immediately after the operation the abdomen was reopened to recover a forceps. *a.*	?
176	1896	MacLaren.	Hysterectomy.	Artery forceps.	Two years later, secondary operation. Found forceps perforating cecum, ileum, and appendix. *a.*	Recovery.
177	1896	?	?	Forceps.	Ferrier stated that one of his associates had recovered a forceps left in the abdomen.	?
178	1897	Morestin.	Salpingitis.	Artery forceps.	Three years later, forceps were passed per rectum, after persistent suffering. *a.*	Recovery.
179	1898	Herczel.	?	Clamp.	One and a half years later, removed by secondary operation. *a*	?
180	1898	?	?	Forceps.	Boldt stated in 1898 that he knew of five cases among colleagues in which a foreign body was left. (Count two forceps.) *a.*	?
181	1898	?	?	Forceps.	See preceding note. *a.*	?
182	1898	?	?	Forceps.	Boldt stated that a pathologist in a N. Y. hospital had found a foreign body at autopsy in two cases. (Count 1 forceps, 1 sponge.) *a.*	Death.
183	1898	?	?	Forceps.	Boldt mentioned two cases in which abdomen was reopened to recover article left. (Count 1 forceps, 1 sponge.) *a.*	?

ABDOMINAL SECTION. FORCEPS AND OTHER ARTICLES LEFT.

No.	Date of Report.	Operator*	Character of Operation.	Article Lost.	When and How Removed.	Result.
184	1898	Nussbaum.	?	Drainage tube.	Two months later, patient herself drew it out of an abdominal sinus after a night of dancing. *a.*	Recovery.
185	1898	Bode.	?	Drainage tube.	Tube slipped into wound and was forgotten. After a few days wound was reopened and tube found. *a.*	?
186	1898	American surgeon.	?	Diamond ring.	Remained six months in the abdomen. Other details not given.	?
187	1899	Lasallette.	Large fibroid.	Forceps.	Found at autopsy. Criminal trial. Operator sent to prison. (See Legal Complications.) *c.*	Death.
188	1900	H. A. Kelly.	Hysterectomy.	Forceps.	Found in drainage tract after a few days. In operation to extract it, patient died from hemorrhage. *a.*	Death.
189	1900	G. Braun.	?	Bulldog forceps.	Forceps found at autopsy. *a.*	Death.
190	1900	Sepp.	Ovarian cyst.	Nelaton catheter.	Found in bladder with some silk ligatures, several months later. Catheter had been used to ligate pedicle. *a.*	Recovery.
191	1900	Cushing.	?	Seal ring.	Some years after the laparotomy the ring was recovered by incision in vaginal vault. *a.*	Recovery.
192	1900	Nussbaum.	?	Artery forceps.	Nine months later, passed per rectum. *a.*	?
193	1900	?	?	Piece of glass irrigator.	Two weeks later found at autopsy by Kyewski. Patient died with symptoms of nephritis. *a.*	Death.
194	1900	?	?	Forceps.	Reeves Jackson mentions a case in which autopsy revealed a forceps left in the cavity. *a.*	Death.
195	1900	Spencer Wells.	Ovariotomy.	Artery clamp.	One month later, the clamp was found in the bladder. *a.*	?
196	1900	Spencer Wells.	?	Artery clamp.	Clamp missed. Wound reopened next day and clamp found. *a.*	Recovery.
197	1900	Terrier.	?	Forceps.	Eight days later, forceps was discharged spontaneously from region of umbilicus. *a.*	?
198	1900	Terillon.	?	Forceps.	Neugebauer states that Terillon forgot a forceps in the abdominal cavity. *a.*	?
199	1900	Winkle.	?	Forceps.	Later discharged spontaneously from an abscess. *a.*	?
200	1900	?	?	Richelot clamp.	Details not given. Simply stated that clamp was left behind. *a.*	?
201	1900	Kosinski.	Ovariotomy.	Artery forceps.	Four months later forceps extracted from an abdominal abscess. *a.*	Recovery.
202	1900	Kosinski.	Ovariotomy.	Two artery forceps.	Two secondary operations, in the second of which patient died of hemorrhage. Criminal trial. (See Legal Complic.) *a.*	Death.
203	1900	?	Inoperable tumor.	Artery forceps.	Found at secondary operation by another operator, who related the case to Neugebauer. *a.*	?
204	1901	M. D. Mann.	?	Hemostat.	Removed in one hour after operation. No trouble resulted. *b. c.*	Recovery.
205	1901	Schachner.	Uterine fibroid.	Forceps.	Seven months later, secondary operation for ileus. Forceps found within intestine. Removed by incision. *b. c.*	Recovery.
206	1901	?	?	Forceps.	Removed at autopsy, after a laparotomy. Witnessed by J. A. Wyeth. *b. c.*	Death
207	1901	?	Strangulated hernia.	Forceps.	Eight and a half years later, part of forceps was extracted from an abdominal sinus. Cited by Ellison. *d.*	Recovery.
208	1901	Nussbaum.	?	Scissors.	Later, secondary operation. Scissors found. Cited by Senn in letter to Schachner. *b. c.*	Recovery.
209	1904	Prochownick.	?	Forceps.	Six months later half of forceps extracted from sinus in scar. *c.*	Recovery.
210	1904	?	Myomectomy.	Pean forceps.	Six years later, secondary operation for ileus. Forceps found. Patient died. Reported by Hedlund. *d.*	Recovery.

ABDOMINAL SECTION. FORCEPS AND OTHER ARTICLES LEFT.

No.	Date of Report.	Operator*	Character of Operation.	Article Lost	When and How Removed.	Result.
211	1906	?	Ovarian cyst.	Forceps.	Seven years later, forceps felt through abdominal wall. Extracted by vaginal incision by Gruzdews. *d.*	Recovery.
212	1906	?	?	Forceps.	Secondary operation later by Gruzdews, and forceps found. *d.*	?
213	1906	?	Ovariotomy.	Artery forceps.	Ten and a half years later, secondary operation. Forceps perforating bowel. Reported by Stewart. *d.*	Recovery.
214	1906	?	?	Artery forceps.	Six years later, death from intestinal necrosis. Forceps found at autopsy within bowels. Reported by LeGéndre. *d.*	Death.
215	1906	?	?	Forceps.	Doyen did a secondary operation, and found forceps within intestine. Resection. *d.*	?
216	1906	?	?	Artery forceps.	Four months later, secondary operation by Ward for ileus. Forceps found.	?
217	1907	Dollinger.	Sarcoma of abdominal wall.	Forceps.	Nearly three years later (after two successful pregnanices) trouble from forceps. Operation. Death Lawsuits. *d.*	Death.
218	1907	Kuestner.	Cyst of pancreas.	Forceps.	Six weeks later, forceps appeared at angle of scar and was extracted. *d.*	Recovery.
219	1907	?	?	Forceps.	Found at autopsy. Death soon after operation, of shock. *d.*	Death.
220	1907	?	Ovarian carcinoma.	Forceps.	Found at autopsy. Death after six days, of ileus and peritonitis. *d.*	Death.
221	1907	Paris surgeon.	?	Piece of instrument.	Details not given, except that piece was left in abdomen at operation. Criminal trial. *d.*	Death.
222	1907	?	?	Pair of spectacles.	Three operations—in America, Germany, France. Frenchman found spectacles in abdomen. German was sued for damages. *d.*	Recovery.

VAGINAL OPERATIONS. SPONGES AND OTHER ARTICLES LEFT.

223	1886	Veit.	Vaginal hysterectomy.	Rubber drain.	Four months later, drain passed per rectum. *d.*	Recovery.
224	1886	Veit.	Vaginal hysterectomy.	Rubber drain.	Later expelled from the bladder. Details not given. d.	Recovery.
225	1897	Friend of H. C. Coe.	Vaginal hysterectomy.	Gauze sponge.	Two days later, on removing clamps one was found to be a sponge-holder minus the sponge. Laparotomy, found sponge under liver. *a.*	?
226	1898	Erlach.	Vag. operation for fibroid.	Iodoform-gauze pack.	Nine days later, strip found in vaginal abscess. Nine months later, another strip removed from bladder. *c.*	Recovery.
227	1898	Boldt.	Vag. drainage after abdom. hysterectomy.	Gauze drain, inserted third day.	Drain forgotten. Two months later the gauze was passed per rectum. *a.*	Recovery.
228	1898	Rydygier.	Vaginal hysterectomy.	Sponge.	Seven weeks later, sponge was discharged from vaginal sinus. Patient finally died of pyemia.	Death.
229	1899	Meinert.	Pelvic tuberculosis.	Iodoform-gauze strip.	Five months later, extracted from vaginal sinus.	Recovery.
230	1899	?	Adnexal trouble.	Compress.	One year later, extracted from a vaginal sinus. Cited by Meinert. *a.*	Recovery.
231	1899	Schramm.	Pyosalpinx.	Tampon.	Ten weeks later, tampon came out while patient was dancing. *c.*	Recovery.
232	1900	Hillmann.	Pyosalpinx.	Gauze sponge.	Found later in bladder, accompanied by violent cystitis. *c.*	Death
233	1901	?	Pelvic inflammation.	Sponge.	Later secondary operation (abdominal section) and sponge found in pelvis, by L. Frank. *b. c.*	Recovery.
234	1901	Pryor.	Vaginal operation.	Gauze.	Details not given. Cited by W. R. Pryor. *b. c.*	?

VAGINAL OPERATIONS. SPONGES AND OTHER ARTICLES LEFT.

No.	Date of Report.	Operator*	Character of Operation.	Article Lost.	When and How Removed.	Result.
235	1901	Assistant to Pryor.	Vag. operation.	Gauze.	Details not given. Cited by Pryor. *b. c.*	?
236	1901	Assistant to Pryor.	Vag. operation.	Gauze.	Details not given. Cited by Pryor. *b. c.*	?
237	1902	?	Uterine tumor.	Tampon.	Four months later, tampon was extracted per vaginam. Reported by Gudbrod. *d.*	Recovery.
238	1906	Brothers.	Vaginal hysterectomy.	Gauze drain.	Several months later, drain was extracted through vaginal sinus.	Recovery.
239	1907	MacLaren.	Pelvic suppuration.	Iodoform-gauze strip.	Two months later, the patient extracted a twelve-inch strip of gauze from vagina.	Recovery.
240	1908	Calmann.	Vaginal hysterectomy.	Sponge, slipped from holder.	Extensive palpation per vaginam, extending to liver and kidneys. Not found. Removed later by laparotomy.	?

a. Cited by Neugebauer, 1900.
b. Additional cases, cited by Schachner, 1901.
c. Cited by Neugebauer, 1904.
d. Cited by Neugebauer, 1907.
*Supposed to be the operator. In some cases the record is not entirely clear on this point.

References for all cases cited in the table, and also other items in connection with this subject, are given in the original article (Am. Jour. Obstet., Vol. 59). Since the list was made many other cases have come to notice, but it is not necessary to include them. The author's object is not to give a complete list, but simply to present actual cases in such number and variety that operators will be led to pause and think on this subject.

Excision of Fat from Abdominal Wall.

In certain cases excision of a mass of fat from the wall of the abdomen is indicated, for two reasons, (a) to facilitate work on deep pelvic structures by allowing better access to them and (b) to relieve the patient of a part of the unwieldy burden. Interesting experiences in this work and helpful suggestions may be found in the article by H. A. Kelly (Surgery, Gynecology and Obstetrics, 1910) and in the article by Francis Reder (Am. Jour. Obstet., 1911).

Fat tissue breaks down very easily and hence must be handled with particular care. A traumatism or a mild infection that would cause but little disturbance in muscle or connective tissue, may cause extensive breaking down of fat tissue. When excising a mass of fat from the abdominal wall the following facts should be kept in mind:

1. The fat is preferably removed by incisions extending crosswise of the abdomen, as indicated in Fig. 866.

2. The accumulation of fat is principally in the lower part of the abdominal wall, hence the mass to be excised will lie largely or entirely below the umbilicus. This is indicated in Fig. 866, where the umbilicus is shown dimly just below the upper broken line. Of course the location of the mass to be excised varies considerably in different cases, but when worked out carefully with regard to the landmarks (anterior superior spines of the ileum, pubic bone and umbilicus), it will usually have about the relations shown in the illustration. There is often a

marked transverse crease just above the pubis, which the lower incision may follow in a general way.

3. It is well to make the first transverse incision through the center of the mass to be removed, as indicated by the black line in Fig. 866. This central incision, carried through the whole fat layer, shows definitely the thickness of the layer and, also, enables the operator, with his fingers in the incision, to estimate

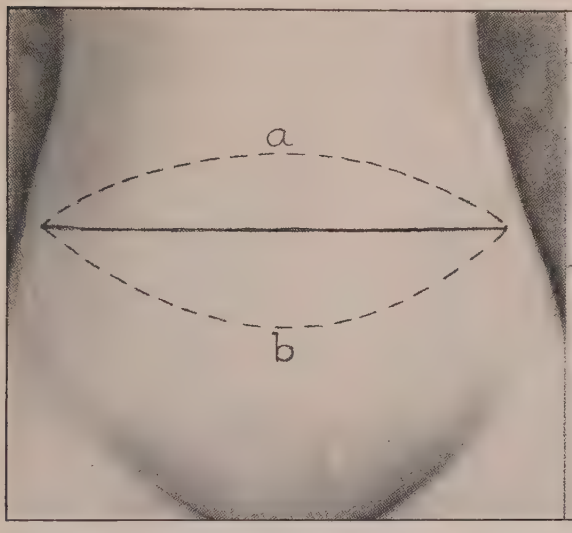

Fig. 866.

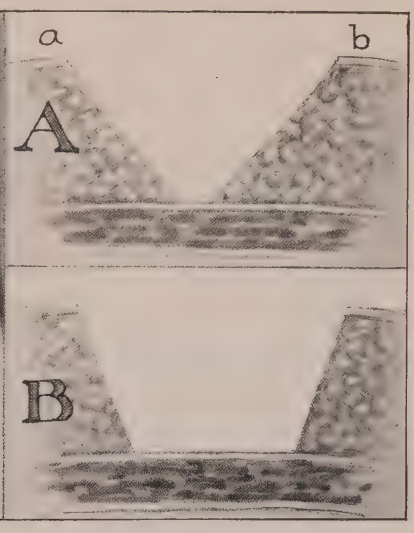

Fig. 867.

Figs. 866 and 867. Excision of Fat from the Abdominal Wall. It is well to make the primary incision through the center of the mass to be removed, as indicated by the heavy black line in Fig. 866. From the depth of the incision the redundant tissue above and below it may be palpated, and the amount to be removed, as indicated by the broken lines, may be gauged with accuracy and excised with precision.

The correct method of removing the mass of fat, the lines of excision meeting at the aponeurosis, is shown in Fig. 867,A. The Incorrect Method of fat excision is shown in Fig. 867,B. The defects of this method are explained in the text.

how large a mass should be removed from each side of the incision. In that way the upper and lower incisions, indicated by the broken lines, may be placed accurately with a minimum of traumatism. The incisions should be made with a large sharp knife that cuts cleanly and with no haggling or bruising.

4. The upper and lower incisions should be carried down obliquely so that they meet at the bottom, as shown in Fig. 867,A. Reder warns particularly against cutting down almost perpendicularly, as shown in Fig. 867,B, with the idea of sliding the fat layer on the aponeurosis to bring about approximation. He found that the undermining of the fat necessary for sliding and approximating at the bottom of the wound led to fat necrosis and extensive breaking-down of the wound.

5. In stopping the bleeding, the bleeding points should be caught with only a minimum of surrounding tissue. Some bleeding points will require ligature

(fine plain catgut), while others are taken care of by compression for a few minutes.

In sponging, care should be exercised to avoid scraping or bruising the surfaces. All oozing should be checked before closing the wound.

6. When the desired fat wedge has been removed, the fat surfaces are to be protected with moist towels or gauze, while the abdominal cavity is opened by longitudinal or transverse incision, and the intra-abdominal lesions are taken care of.

7. After the abdominal wound is closed in the usual way to the fat layer, the tension sutures of silkworm-gut are passed. These are passed through the skin,

Fig. 868.

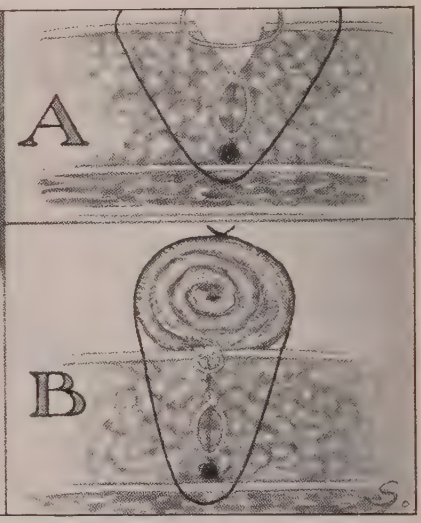

Fig. 869.

Figs. 868 and 869. Suturing the wound after the fat excision. A small rubber tissue drain is placed in the angle on each side, as here shown. If suturing of the fat, as indicated in Fig. 868, is found necessary, plain fine catgut should be used and the sutures should, as far as possible, grasp connective tissue trabeculæ instead of fat. The closure is then completed by suturing the skin (Fig. 869) and tying the silkworm-gut tension sutures over the gauze roll (Fig. 869).

fat and aponeurosis and then out through the aponeurosis, fat and skin on the opposite side. They are placed along the wound at intervals of one or two inches. They are to be left loose until the wound has been closed by approximation sutures.

8. A slender drain of rubber tissue is then laid in each angle of the wound. The inner end of each drain extends toward the center, as shown in Fig. 868.

9. If the surfaces are so rough that good appropriation is not likely to result from simple apposition, the surfaces may be sutured together at intervals, with fine plain catgut, as indicated in Fig. 868. Where it is possible to effect approximation by suturing together fibrous trabeculæ instead of fat, that is preferable.

In most cases, however, the deep tension sutures insure good approximation and render suturing of the fat unnecessary, just as in closure of the ordinary longitudinal incision in a fat wall.

10. The skin margins are then approximated by a plain catgut suture (Fig. 869,A and B) or in any other way preferred by the operator.

11. The silkworm-gut tension sutures are then tied over a large roll as in the closure of the ordinary longitudinal incision (Fig. 869,B). These tension sutures should not be tied tightly. The blood supply of the fat is poor and considerable primary tension, augmented by reparative swelling, may cause fat-necrosis.

12. The ordinary dry abdominal dressing may be used, or if preferred, a moist dressing. The drains may be removed in forty-eight hours, if no evidence of infection appears. The subsequent after-treatment is the same as for the ordinary abdominal incision.

CHAPTER XVI.

AFTER-TREATMENT IN ABDOMINAL SECTION.

The details of the care of a patient after abdominal section may be divided into (A) the regular after-treatment and (B) the care in special conditions.

A. REGULAR AFTER-TREATMENT.

First day. During the operation the bed which the patient is to occupy should be warmed with hot-water bottles placed under the blankets. When the patient is placed in bed the hot-water bottles are distributed about her, to maintain the heat and diminish shock. Care should be taken that there is no leakage from any bottle, and that a thick blanket is everywhere between the hot bottles and the patient. Much discomfort and even serious injury may follow a burn from a hot-water bottle, caused by the bursting of a bottle or leakage from a bottle, or a too thin protective covering between the bottle and the patient. In several instances legal complications have resulted, involving the nurse or the hospital or the physician.

The patient's head should be low (no pillow under it) until she has recovered from the anesthetic. Keep the patient quiet and let her sleep as long as she will from the anesthesia. If the patient vomits, she should be turned well over on the side to cause the vomited material to run out of the throat by gravity, that there may be no chance of its getting into the larynx and choking her. Rolling the patient over on the side and arranging pillows to keep her in that position is much better than simply twisting the neck as is done so frequently. To diminish the thirst, swab the interior of the mouth frequently (when the patient is awake) with cold water, either plain or acidulated with a few drops of vinegar or lemon juice.

The **orders** for the first day are usually as follows:

One quart of 3 per cent glucose and 2 per cent sodium citrate to be given, immediately on return to bed, as enema to be retained (not by proctoclysis). Codeine sulphate gr. i hypo., as necessary to give rest, may be repeated as often as every two hours.

May have water as soon as she wishes it—hot or cold, as best retained, frequently, in small amounts unless vomiting persistently.

May be propped up in bed to void. If unable to void after the usual expedients are employed (warm water to genitals, pressure on bladder, etc.) catheterize at eight hour intervals or oftener, so that not more than 12 ounces collect in bladder. Irrigate with 3 per cent boric after each catheterization.

In cases where a complete hysterectomy has been done and a retention catheter is in place, irrigate twice daily with the boric solution.

The one quart of fluid as given above is sufficient in most cases and it is well to avoid further administration per rectum unless the patient does not take sufficient by mouth.

It is not necessary ordinarily for the patient to be kept strictly on her back. After a few hours, if very tired of the one position, she may be propped partly to one side or the other occasionally. But she must not be allowed to develop that restlessness that insists on constantly changing from one side to the other in an endeavor to find a comfortable position. No position is very comfortable under the circumstances and the too frequent changing increases the discomfort.

The patient should be quieted as much as possible without medicine, in order that the administration of sedatives may be avoided or kept within small amount. The nurse can do much by arranging the patient comfortably in bed and directing her frequently to keep the eyes closed and to nap as much as possible. If there is such severe pain that the codeine does not give rest, morphia, in $\frac{1}{6}$ gr. doses, may be given, but that is rarely necessary. If preferred, the sedative may be given by suppositories, but its effect is not so prompt and cannot be so accurately graduated.

As a rule the author prefers to let the patient have water in small doses as soon as she wishes it. It diminishes the thirst and helps to supply the system with needed fluid. Occasionally vomiting does no harm; rather it is beneficial in that it helps to clear out the ether-saturated mucus, the retention of which increases stomach irritation and disturbance.

If there is repeated vomiting, and especially if there is persistent epigastric pain, a stomach-tube should be introduced and the stomach washed out with normal saline solution. This stomach washing (lavage) has come to be recognized as a most important measure in postoperative treatment. It is the only effective treatment for the serious complication of acute dilatation of the stomach, and in any case of persistent stomach irritation it adds much to the patient's comfort by clearing out the irritating material. The details of stomach lavage are given later in this chapter under "Persistent Vomiting."

If the patient cannot take water by mouth, the thirst may be diminished by saline solution per rectum by the drop method (proctoclysis). If the patient is in shock, start the proctoclysis and employ the other measures for that condition. The details of proctoclysis are given later in this chapter under "Peritonitis."

Second Day. During the second day the orders previously given are continued unless there is some special reason for modifying them. The patient make take water more freely, and the liquid nourishment is now begun and gradually increased as the stomach will bear it. For this purpose any liquid except milk is permissible; broths, albumin water, fruit juices, tea, etc., as best retained by the patient.

If the patient has to be catheterized, it is well to give some reliable urinary antiseptic to diminish the danger of cystitis. If gas in the intestines is troublesome, a rectal tube may be introduced. If the operation was an emergency one, where there was no opportunity for preliminary preparation of the intestinal tract, it may be advisable to secure a bowel movement within

the second twenty-four hours, in which case an enema of mag. sulphate oz. i, glycerine oz. ii and water oz. iv may be given. This may be used also in those cases where the rectal tube does not relieve the gas pains and distention.

Third Day. At the beginning of the third day start the patient on the purgative regimen, indicated below, that a bowel movement may be secured some time during this twenty-four hours.

The **orders** for the third day are usually about as follows:

Magnesium citrate oz. iv and repeat after two hours. If no bowel movement after four hours give the magnesium-sulphate-and-glycerine enema. Continue the codein as necessary to give rest.

Continue urinary antiseptic.

It should be remembered, however, that no cathartic should be given until vomiting has ceased and flatus has been expelled either with the rectal tube or enemata, because persistence of vomiting and distention that cannot be relieved is always suggestive of obstruction, due either to paralysis of the bowel or some other mechanical factor, kinking, adhesions, etc.

The proctoclysis, if it is being used, should be stopped as soon as the patient is taking sufficient fluids by mouth, as indicated by the output of urine, as in some cases the rectal irritation may keep up vomiting.

Fourth Day. Ordinarily by this time one or two good bowel movements have been secured, and the patient has become fairly comfortable. If the kidneys are secreting well, the proctoclysis may be stopped. All medicines may now be given by mouth. The patient may be propped up as necessary, to aid in urination if she is not already urinating. Some semisolid and solid articles of diet (custards, breakfast foods, toast, crackers, bread, etc.) may be allowed. As a rule, no sedative is now necessary, except an occasional dose of sodium bromide when the patient is particularly restless at night. It is well to start the patient on some good iron tonic, for these patients are usually anemic. The elixir of iron, quinine and strychnine, given in teaspoonful doses after meals, does well for most cases. If preferred, Blaud's pills or some of the numerous organic iron preparations may be used.

The **orders** given at this time may serve as standing orders, to be continued as long as the patient is in the hospital, except when modified for some special indications. They are about as follows:

Light diet, with extras. Push the nourishment. Give an abundance of water and liquid nourishment. Articles from the regular diet may be added as desired.

Continue the iron preparation.

Continue the urinary antiseptic.

Mild laxative (phenolphthalein, cascara, etc.) at night as needed. Give an enema when there is no bowel movement during the day.

Subsequent Orders. The *care of the bladder* is an important item after pelvic operations. The urinary antiseptic should be continued until danger of urinary infection is passed—ordinarily about a week after the bladder is

emptied spontaneously. Curtis (Jour. Am. Med. Assn., June 22, 1918) demonstrated that unsuspected residual urine is the most common cause of post-operation cystitis. Ordinarily, after being catheterized a few times the patient begins urinating spontaneously and it is supposed that she is emptying the bladder each time. Catheterization of these patients immediately after urination showed that a large proportion of them did not empty the bladder completely for several days after the beginning of spontaneous urination. This residual urine, though small in amount, invited bacterial activity with consequent troublesome symptoms which in some cases persisted for months after the operation. When a patient has to be catheterized at all after operation, catheterization with the accompanying irrigation should be continued at least once daily, immediately after urination, until all residual urine disappears. By following this plan, Curtis was able to practically eliminate post-operative bladder troubles.

The **diet** is gradually increased until the patient is taking regular diet with extras. She should continue to take liquid nourishment between meals. During convalescence the patient does not take and digest sufficient food; the digestive powers may be increased by massage, salt rubs, passive movements and resisted movements, judiciously administered by a competent nurse. The careful carrying out of the regular nursing given bed patients (including the daily morning bath and evening alcohol rub) is also an important factor in causing the patient to be comfortable and to rest well at night, and to digest her food promptly. If there is any decided digestive disturbance, some remedy for that should of course be given.

Removing the sutures and strapping the abdomen. Unless there is some indication of irritation in the wound, the inner dressing is not to be disturbed for ten days. Then it is taken off and the sutures removed. The wound is now healed. The vicinity of the wound is dusted freely with boric acid powder (Fig. 870), a smooth piece of gauze (several thicknesses) is laid over the area (Fig. 871), and the abdomen is strapped with strips of two-inch adhesive plaster in such a way as to take the strain from the newly healed wound (Figs. 872 and 873). Six to eight strips are put on so as to give firm support. Then a piece of cotton is placed over all and the binder reapplied.

The adhesive strips are usually left undisturbed for several days. If it is desired to look at the wound area, because of irritation along the suture tracts or for other reason, the adhesive plaster is cut along the edges of the gauze (Fig. 874) and the gauze removed so that the scar and vicinity are exposed (Fig. 875). After the required treatment, gauze is again applied and then new plaster put on, the ends of the new plaster adhering to the old plaster at each side (Figs. 876 and 877). This procedure permits inspection of the wound area as often as desired without the discomfort of repeated removal of plaster from the skin.

Ordinarily, however, the adhesive strips need not be disturbed for a week. In the meantime the patient's corset is adjusted over the adhesive strips. The

straight-front corset, generally worn at present, furnishes much more satisfactory post-operative support than the specially made belts formerly used. When the straight-front corset is properly adjusted, it gives the needed firm support across the lower abdomen, is perfectly loose about the waist so that there is no waist-

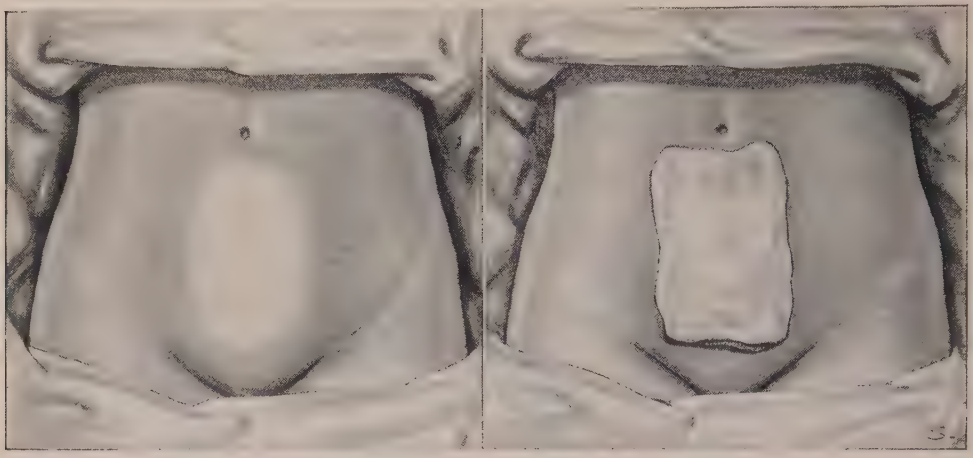

Fig. 870. Fig. 871.

Fig. 870. The sutures removed and the area powdered freely with boric acid. A large amount of the boric acid powder should be used, as it absorbs moisture and prevents itching and irritation.

Fig. 871. The flat gauze applied, ready for the strapping.

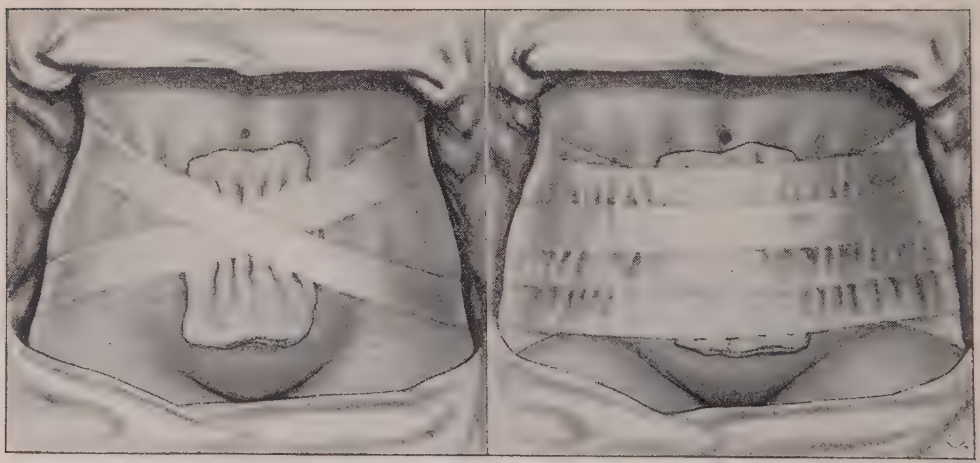

Fig. 872. Fig. 873.

Fig. 872. The two diagonal strips of two-inch adhesive plaster applied. These should be long enough to take firm hold at the sides, so there is no chance of their loosening and coming off. They should be applied with moderate tension, as here indicated, to give good support.

Fig. 873. The transverse strips applied. These also should be long enough to take firm hold at the sides. Plenty of adhesive plaster should be used, so as to form a support which will permit the patient to be up and about without any possible danger of the newly-healed wound being burst open by sneezing or coughing or other strain.

constriction, and gives the support to the back to which the patient is accustomed. The corset, properly adjusted, has proved so satisfactory in the experience of the author that it has practically superseded the specially made belts.

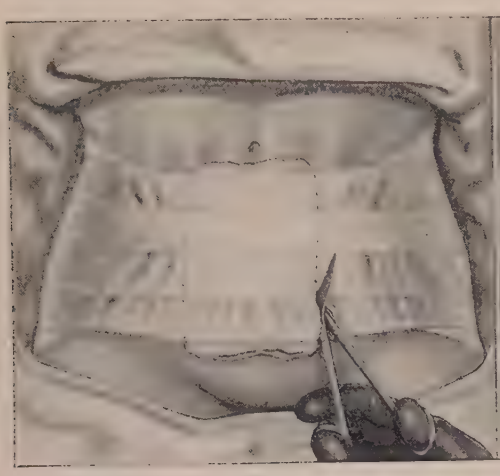

Fig. 874.

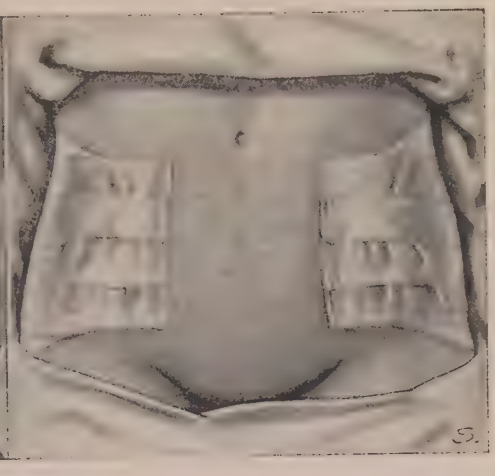

Fig. 875.

Figs. 874 and 875. Subsequent Dressings. In the later dressings, the adhesive strips are cut along the margin of the gauze, as indicated in Fig. 874, and the gauze removed, exposing the scar as in Fig. 875. After the required treatment, the fresh dressing is applied, and new adhesive strips are applied over the old ones. This obviates the frequent removal of the adhesive plaster from the skin, which is annoying to the patient and in some cases causes abrasions of the skin. New adhesive strips may be thus applied over the old ones three or four times if necessary, and in the meantime the adhesive first applied has become slightly loosened by the skin secretions, so that it comes off easier than if recently applied.

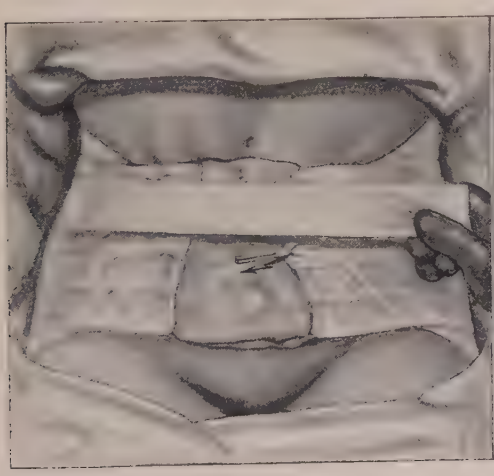

Fig. 876.

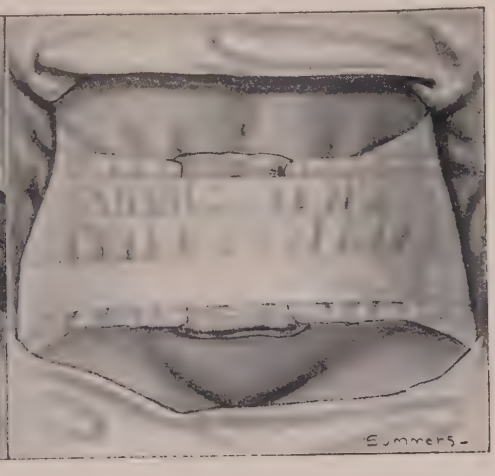

Fig. 877.

Fig. 876. The new dressing applied and the first new adhesive strip being put on over the old ones. With a forceps or the fingers, the sides of the old plaster support are drawn tense, as here indicated, as the new adhesive strips are applied.

Fig. 877. The renewed adhesive support completed. Use as many strips as needed for secure support.

The corset is removed at night. The adhesive-strip support is continued up to about four weeks after the operation. After that time no support is required at night, while during the day the corset is worn. If the patient feels uncomfortable or uneasy without something around the abdomen at night, a firm muslin binder may be made and worn for a time.

Sitting Up, Walking. Unless there is some special reason for hurrying the patient to the sitting posture, she should be allowed to remain quiet and in the recumbent posture for the first few days. After the bowels have moved well, the patient should be encouraged to move about in the bed and to be propped up as much as she likes—more and more each day—so that by the end of the first week she is sitting up straight in bed. By the eighth or ninth day she may sit on the edge of the bed and be out of bed on the tenth day. The advantages of this early moving about in the bed and early getting up are better circulation (less "bed-weakness"), and consequently better repair of wounds, better digestion and quicker restoration to normal condition.

It is not advisable, however, to get the patient up too early, while Nature is still fully occupied with the acute repair work of the first few days. The feeling of the patient is, as a rule, the best guide as to when to begin activity. The plan just described is decidedly preferable to the "hurry up" method of getting the patient out of bed in one to two days, which was recently so popular with some. In cases where the patient will be benefited by further rest, do not hesitate to keep her in bed two weeks, or even longer. In many instances the patient is greatly debilitated and literally "worn out" by chronic sepsis or by months of suffering and ill-health, or by heroic work for her children in spite of failing strength. In all these cases, the enforced rest in bed may be an important aid in restoring the patient's health.

If the abdominal wall is found lax and atonic, as is so frequently the case, exercises for strengthening the abdominal muscles should be carried out regularly night and morning for several months after operation. They may be begun before the patient leaves the hospital or as soon thereafter as she finds she can carry them out without discomfort.

After the patient has returned to her home, the tonic medicines and regimen should be kept up for three to six months, as necessary, to put the patient in first-class general health.

B. SPECIAL CONDITIONS.

The special conditions to be considered are as follows:

1. Drainage Cases.
2. Uterine Retrodisplacement Cases.
3. Severe Shock.
4. Internal Hemorrhage.
5. Persistent Vomiting.
6. Acute Dilatation of Stomach.

7. Kidney Insufficiency.
8. Constipation and Intestinal Paralysis.
9. Intestinal Obstruction.
10. Peritonitis.
11. Local Suppuration.
12. Phlebitis.
13. Pain During Convalescence.
14. Subsequent Disturbances.

1. Drainage Cases. When a **hard rubber tube** is left extending into the pelvis for drainage, a large piece of sterile sheet-rubber is usually slipped over the end of the tube to keep the fluid that comes out of the tube from soiling the gauze on the abdominal wound. A small wick of twisted gauze is then passed to the bottom of the tube to aid in the drainage. This twisted wick should be small enough to leave plenty of room around it inside the tube to permit the discharge to come out. Some pieces of gauze are now placed over the end of the tube and the piece of sheet-rubber is folded over the gauze from all sides. The whole is then covered with a large piece of sterile cotton and the binder applied, taking care to avoid pressing on the tube. This is the technique ordinarily employed in the dressing at the time of the operation.

The frequency with which the drainage tube must be dressed varies with the amount of drainage fluid. In chronic cases, where the pelvis is left fairly dry, the amount of fluid is usually small. It is well to dress the tube within three to six hours, or before if there is a probability of much oozing or secretion. The frequency of the subsequent dressing is regulated by the amount of fluid found. The idea is to change the dressing before all the gauze confined in the rubber-dam becomes filled with absorbed fluid. Usually every eight to twelve hours is sufficient for the first two days and after that once daily.

In cleansing and dressing the tube the strictest asepsis must be observed. The instruments needed are simply a long probe or applicator, for pushing the gauze wick to the bottom of the tube, and a scissors for cutting the gauze. These instruments should be boiled, and in addition to the ordinary disinfection of the hands it is well to wear sterilized rubber gloves (Fig. 878). After the preparation of the instruments and of the physician's hands, the binder and outer part of the dressing are removed by the nurse, thus exposing the sterile sheet-rubber. The physician then unfolds the sheet-rubber and removes the gauze therein and also the saturated gauze wick in the tube. Another gauze wick is then twisted, taking care to remove all loose ravelings. The end of this sterile wick is then pushed to the bottom of the tube and left there for a minute to absorb the discharge. It is then removed and a fresh one introduced. This process is repeated until all the fluid in the tube is removed. A fresh wick is then introduced and gauze is placed about the

end of the tube, and the sheet-rubber folded over as before. The inner surface of the rubber-sheeting should be cleansed with some reliable antiseptic solution (e.g., bichloride, 1-2000) and the interior of the tube may be cleansed with a gauze wick wrung out of the same solution. Also, the tube should be raised slightly and rotated once daily, in order to prevent injurious pressure on the rectum (which might cause perforating ulceration) and to prevent stopping-up of the drainage holes by omentum or bowel, or exudate.

The tube is removed when the collection of fluid in the pelvis ceases—that is, in two to five days. In suppurative cases the secretion, of course, keeps up indefinitely. In such a case, the tube is left in until all acute threatening

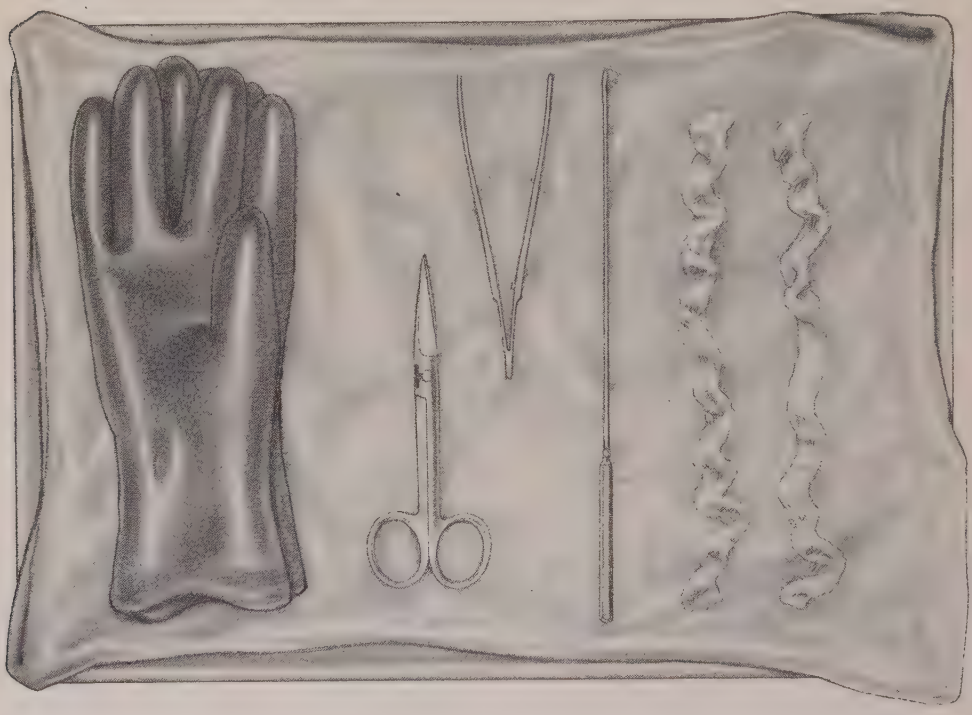

Fig. 878. Articles for dressing the abdominal drainage tube—rubber gloves, scissors, dressing forceps, narrow gauze wicks and a long probe for introducing the wicks to the bottom of the drainage tube.

symptoms have disappeared and until a good wall has formed about the tube tract, shutting it off from the general peritoneal cavity. It may as a rule be removed in four to six days, and a small soft rubber tube or piece of gauze inserted into the tract to keep the outer end open until it closes from the bottom. The treatment of such a tract is to keep it clean by cleansing (daily or less frequently, as needed) with hydrogen peroxide, keeping the outer end open as mentioned, and protecting it from secondary infection by an antiseptic dressing. It is well to keep some antiseptic drying powder (e.g., boric acid) dusted freely on the wound about the drainage tube.

In acute cases, where there is virulent infection and free secretion, the tube must be cleansed very frequently—as often as every two or three hours at first. In these cases, where the fluid is abundant, the removal of it from the tube is preferably accomplished with a syringe. A very convenient arrangement for this purpose is the ordinary hard rubber syringe with a soft rubber catheter attached. In the very acute cases, where drainage in various directions is required and it is necessary to leave the wound partly open, the whole dressing soon becomes soiled with the discharge and consequently must be changed frequently. In fact, in some of these cases it is advisable to employ

Fig. 879. Elevation of the Upper Part of the Body, to aid Drainage toward the pelvis. This simple elevation of the head of the bed is employed immediately after operation and also at other times when the patient is too weak to be placed in the "half-sitting" or Fowler posture. The head of the bed is to be raised eighteen to twenty-four inches (46 to 61 cm.).

warm moist dressings (wrung out of normal saline solution or boric acid solution, 3 per cent) all over the abdomen and wound, the moist dressing to be changed every few hours, or as often as it absorbs a considerable amount of the septic discharge.

When **rubber tubing** is used for drainage, it may be used alone or with gauze around the tube or as the "split-tube with gauze." In the latter a piece of large rubber tubing is split longitudinally and a small wick of twisted gauze laid inside, but the gauze wick must be small enough to permit the free escape of fluid through the tube. Rubber-tube drains are left

in until the necessity for drainage has disappeared and the drainage tract is largely closed from the bottom. Where the rubber tube is of large size, it is removed after a few days and a smaller size introduced.

When **gauze** is used for drainage, alone or with rubber tubing, it is removed usually in two to four days.

In all drainage cases, except where the patient is in severe shock, the upper part of the body should be raised higher than the pelvis, so as to cause all septic fluid in the peritoneal cavity to gravitate to the pelvis, where it is removed through the drainage tube. Immediately after the operation raise the head of the bed about two feet (Fig. 879). After the patient has recovered from the anesthetic she may be propped up in the half-sitting posture (Fowler posture—Fig. 880). The prone posture is still more effective for pelvic drainage through the abdominal incision, and the patient can usually maintain at least the semiprone posture most of the time without much discomfort.

In acute septic cases normal saline solution should be used freely per rectum, as described a few pages later under "Peritonitis."

2. Uterine replacement cases. The principal special point in the care of the patient after any operation for fastening the uterus and adnexa forward, is to see that the bladder is not allowed to fill sufficiently to force the uterus backward again in the first few days following operation. If the patient cannot urinate, she should be catheterized often enough to prevent injurious distention.

3. Severe shock. When the patient is in severe shock, the head should be lowered by the elevation of the foot of the bed about two feet (Fig. 881), except in those cases where there is danger of spreading pus from the pelvis to the upper part of the uncontaminated peritoneal cavity.

Give the patient digitalin $\frac{1}{30}$ gr. every two hours and strychnine sulphate gr. $\frac{1}{40}$ every four hours until reaction comes on. On account of the slow action of the digitalin it is well also, if the patient's condition is grave, to give some of the quicker acting stimulants, such as camphor in oil or caffein and sodium benzoate each 2-3 grains, and repeat as necessary. Still more important is the free use of normal saline by proctoclysis, hypodermoclysis, or intravenously. Glucose in 10 per cent solution is also very valuable. Three hundred c.c. may be given intravenously every 4 to 8 hours as necessary. If the shock is primarily due to hemorrhage, transfusion is indicated. The use of oxygen is an additional measure of value where respiration is defective.

The hot-water bottles must be renewed as necessary to keep the patient warm, and the proctoclysis and other treatment should be given in such a way as to avoid chilling of the surface.

4. Internal hemorrhage. A serious internal hemorrhage is indicated by rapid weakening of the pulse, an increase of pain in the abdomen and subnormal temperature. It is rare after the first twelve hours, and usually comes within

the first six hours. If there is a drain through the abdominal incision or into the vagina, there will be a free flow of bloody serum, or, if it is a tube drain, of blood itself.

The treatment of a slight hemorrhage is (a) to elevate the pelvis by raising the foot of the bed (Fig. 881), (b) to put an ice-bag on the pelvis outside the dressing, (c) to keep the patient perfectly quiet on her back, and (d) to give a sedative (codeine) if necessary to secure rest. Discontinue the enemata, as the pelvic disturbance occasioned thereby may increase the hemorrhage, or start it after it had once ceased. Do not give any stimulants or employ any measure that will increase the blood pressure. The hope is that, as the blood

Fig. 880. The Fowler Posture. Head-rest elevated thirty to forty degrees. Slipping down in the bed may be prevented by placing a box at the patient's feet or by elevation of the foot of the bed or by a sling extending from the patient's hips to the head of the bed.

pressure is low, the bleeding will cease for a few hours—long enough to permit effective clotting to take place in the oozing area. In twenty-four hours such clots become so firm that a renewal of the bleeding is not probable.

When the hemorrhage is severe, the abdomen should be promptly reopened (if the patient is seen in time) and the bleeding vessel caught.

5. Persistent vomiting. To make the nausea and vomiting as slight as possible, the patient's head should be low (no pillow) for several hours after anesthesia. For the first day the patient should keep perfectly quiet, with the eyes closed most of the time, so as to nap as much as possible. The nausea is

increased by talking or by even looking about. If a visitor is allowed, it should be for only a few minutes and there should be no talking. When water is begun, it is preferable usually to give hot water, in tablespoonful doses and frequently, though some patients retain cold water very well from the first. When the nausea and vomiting are such that the patient cannot rest, give codeine sulphate or phosphate, ¾ to 1 gr. hypodermatically, and repeat after three hours, as necessary to give rest. If the codeine does not put the patient to sleep, give morphine, in ⅙ gr. to ¼ gr. doses, as needed.

Stomach lavage. The most effective measure for overcoming vomiting and persistent nausea and stomach distress generally, is washing out the stomach with

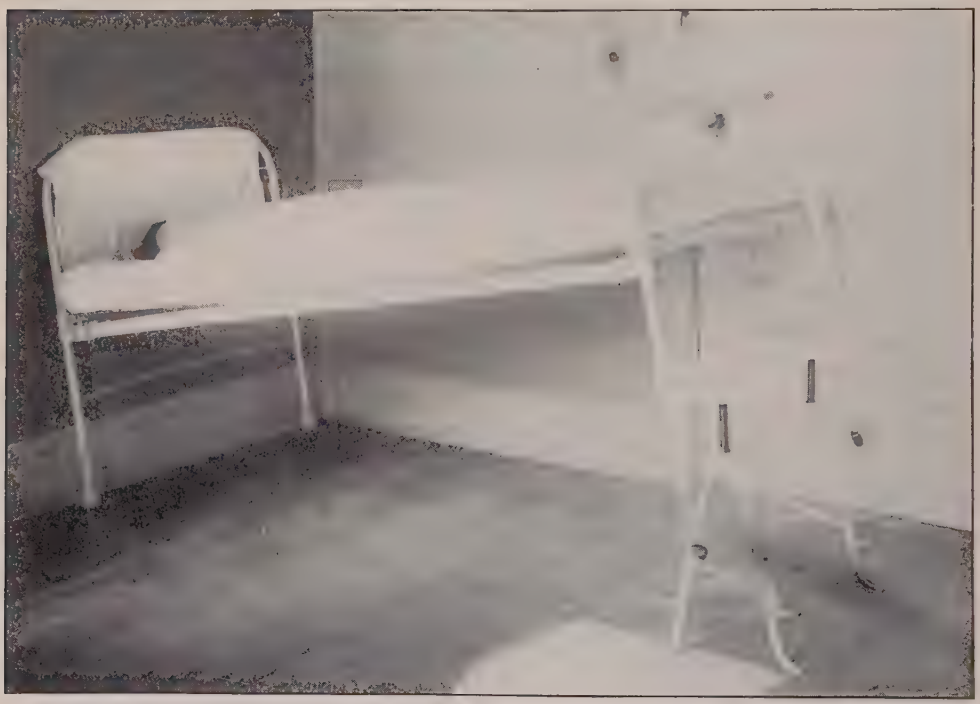

Fig. 881. Elevation of the Lower Part of the Body, for the treatment of Shock. The foot of the bed is to be raised eighteen to twenty-four inches (46 to 61 cm.).

warm saline solution. By attention to detail this may be safely carried out with even the weakest patient, and usually without disturbing the patient greatly. The articles required are shown in Fig. 882.

The patient is moved to the edge of the bed and turned well over on the side and securely propped in that position with pillows. A rubber sheet is then fastened under the chin and allowed to fall over the edge of the bed, as shown in Fig. 883. This is to catch all fluid that comes from the mouth and conduct it to a pail beside the bed. The throat is then sprayed with a four per cent solution of cocaine. After waiting about five minutes, the tube is introduced into the phar-

ynx and down the esophagus into the stomach. This is the period when the patient may become much disturbed. But fright or anxiety or resistance may usually be avoided by a little preparatory explanation combined with tact and the quiet assurance that the discomfort is only temporary and is not serious. In the experience of the author, preliminary spraying with cocaine has been very helpful in eliminating discomfort to the patient. Before introduction, the tube should be cooled in a basin of ice. A gallon of warm saline solution should be prepared—enough to wash out until the fluid returns clear. If it is desired to administer

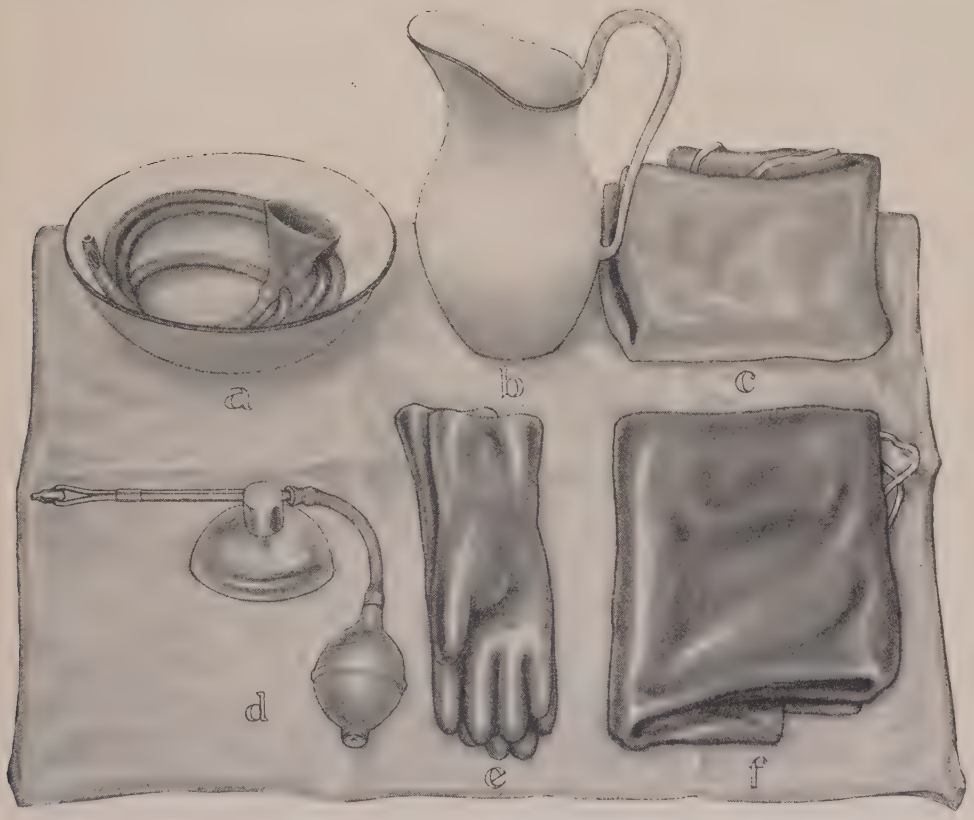

Fig. 882. Articles required for washing out the stomach: *a*, stomach tube in a basin (ice is to be placed in the basin about the tube); *b*, pitcher of warm saline solution; *c*, white rubber cloth for arranging about the patient for conducting all fluids to the receptacle; *d*, atomizer containing four per cent cocaine solution for spraying the pharynx; *e*, rubber gloves for the physician; *f*, black rubber apron for the physician.

a purgative, magnesium sulphate in strong solution or castor oil may be given through the tube, just before it is removed.

Instead of the large tube the smaller duodenal tube may be used. It has the advantage of being easier for the patient to take, being swallowed without much difficulty; and in the cases of persistent vomiting and dilatation of the stomach it may be left in place and washing done every hour until the stomach begins to empty itself. A still further improvement is a small stomach

tube to be introduced through the nose. This small "nasal" stomach tube was devised by R. K. Andrews, and has proved most satisfactory for post-operative lavage. It disturbs the patient much less than the ordinary stomach tube or the duodenal tube, and may be left in place in gastric dilatation or other condition requiring frequent lavage. Lavage should be resorted to promptly when indicated, for delay is dangerous.

Fig. 883. Showing the method of arranging the recently-operated patient for stomach-washing. The patient is to be turned on her side and the head brought to the edge of the bed. Then the white rubber cloth is arranged, as here indicated, so as to protect the clothing and conduct all fluids to the receptacle on the floor. A folded towel is placed over the rubber cloth immediately under the patient's face.

Nourishment per rectum. When vomiting is persistent over several days, nourishment is to be given by rectum. A very good plan is to give an ounce of one of the reliable predigested foods in three ounces of normal saline solution every four hours. This may be given by the drop method, as in proctoclysis with the ordinary saline solution, or it may be given all at one time, as an enema to be

retained. Glucose intravenously every twelve to twenty-four hours is most helpful in these starvation cases, in which acidosis is usually an imminent danger.

6. Acute dilatation of the stomach. This is a serious complication that may develop any time after operation, but especially within the first three days. The patient complains of persistent pain in the epigastric region, and this region becomes more or less distended. The pulse becomes rapid and weak without apparent cause. There is usually nausea and retching, but the most constant and characteristic signs are the persistent epigastric pain and the failing pulse. The anatomical change is overdistention of the stomach with gas, due to different causes in different cases. In the majority of cases it is probably due to some displacement of the stomach, with kinking and obstruction at the pylorus. As the gas cannot escape, its continued accumulation becomes a serious matter, and in several instances death has resulted from overdistention of the stomach caused thereby.

The treatment for this condition is prompt introduction of the stomach tube, to permit the gas to escape, and irrigation of the stomach with normal saline solution, to remove all decomposing material and prevent reaccumulation of the gas. This complication should be watched for and recognized, and the stomach tube used before it reaches a serious stage. If the trouble recurs, several stomach-washings may be required or it may be advisable to leave the tube in place for a time. It is well also to vary the patient's position, so as to overcome displacement of the stomach and dragging on its supports. In some cases it has been thought that the Fowler posture was a factor in the development of this condition.

7. Kidney insufficiency. This is easier prevented than treated after it once develops. The preventive measures are (a) to make sure that the kidneys are doing their work well before operation and (b) to use saline solution by proctoclysis after operation as indicated in the regular orders. The treatment for kidney insufficiency after operation consists in the free administration of normal saline solution by proctoclysis, in elimination by means of free bowel-movements and sweat packs and such other measures as are used for the regular treatment of uremia. In urgent cases the normal saline solution may be given subcutaneously or even intravenously.

If *acidosis* appears, glucose intravenously and alkalies by mouth should be used freely, and in the meantime nourishment by mouth should be pushed.

8. Constipation and intestinal paralysis. When the purgative measures, given previously under the regular after-treatment, fail to cause bowel movement, the loss of function may be due simply to temporary paralysis of the bowel or to intestinal obstruction or to beginning peritonitis. Unless there are decided evidences of mechanical obstruction or of peritonitis, it is to be assumed that the trouble is temporary intestinal paralysis (adynamic ileus) and treatment for the same is begun. This condition is one of the most seri-

ous of post-operative complications. It is due to the paralysis of a segment of the small intestine which, due to the lack of peristalsis, prevents the passage of the intestinal contents past this point. The results are the same as obstruction from kinking, adhesions, etc. There is the persistent vomiting, becoming fecal in the late stages, the distention not relieved by usual measures, and later the toxemia from absorption from the distended bowel. Peritonitis is easily ruled out early. Paralysis may be confused with obstruction from other causes and the differential diagnosis is difficult.

The treatment consists in repeated washing of the stomach, and it is here that the duodenal tube left in place is of geat value; repeated enemas such as magnesium sulphate oz. i, glycerine oz. ii, water oz. iv, enema with 1-2 dr. turpentine, saturated solution magnesium sulphate oz. vi, either alone or with oz. vi olive oil, milk of asafetida, oxgall and others may be tried.

Sometimes pituitrin or eserin will start peristalsis in the right direction, but if there is obstruction the resulting reverse peristalsis is aggravated by these drugs.

9. Intestinal obstruction. This is indicated by the combination of persistent vomiting, absence of bowel movement in spite of the use of the purgative measures already mentioned, severe cramp-like pains in the abdomen recurring every few minutes, a serious rise in the pulse rate and the absence of fever, such as would be caused by peritonitis of sufficient severity to give rise to the other symptoms. Later there is fecal vomiting. Such a combination of symptoms calls for immediate reopening of the abdomen, and relief of the obstruction. Unless this is carried out promptly, there will develop a peritonitis which, in combination with the obstructive trouble, is very likely to prove fatal in spite of later operation.

10. Peritonitis. This is indicated by the combination of symptoms consisting of fever, beginning or increasing after the second day; persistent vomiting, extending into the fourth and fifth days; serious increase in the pulse rate; steady pain in the abdomen, without the cramp-like pains of intestinal obstruction; and an increasing tenderness in the lower abdomen, which gradually spreads to the upper abdomen. The intestinal tract is usually sluggish (partial intestinal paralysis), but there is not the complete absence of bowel movement, such as is seen in intestinal obstruction.

A rise of temperature within the first twenty-four hours after operation is not of serious significance. Not infrequently in extensive operations, involving large peritoneal or connective-tissue surfaces, there is a sharp rise of temperature (up to 102° or 103° F.), coming on within twenty-four hours and subsiding the second or third day without further disturbance. In the absence of a more definite explanation, this "aseptic rise of temperature" is said to be due to the "absorption of blood-ferment." But when there is a rising temperature after the second day, it is indicative of some unusual disturbance, and when the combination of symptoms above mentioned is present the diagnosis of peritonitis is clear.

The treatment of peritonitis following operation is the same as for peritonitis

without operation, and the operative measures to be employed have already been described in the chapter on acute pelvic inflammation. In addition to drainage of the infected areas and gastric lavage and general supporting measures, the supplying of fluid to the body by proctoclysis is important.

Proctoclysis. The introduction of normal saline solution into the system gives important aid to the heart and kidneys, and facilitates the elimination of septic material. It is best given by continuous absorption from the rectum. To secure this certain essentials must be observed, as follows: (a) the fluid must be maintained at a temperature of about 100° F., (b) it must flow into the rectum slowly, drop by drop (about one and a half pints per hour), and (c) there must be no obstruction or constriction in the tube that would interfere with the free regurgitation of fluid or gas from the rectum. The apparatus, whether simple or elaborate, must conform to these requirements. The success of the method depends upon accuracy in its application. The following description is that given by J. B. Murphy, who developed the method in connection with the treatment of general peritonitis.

"As soon as the patient is returned to bed after operation, proctoclysis is instituted and maintained until the serious symptoms of intoxication cease. The continuous method is by far the most scientific and successful. Moderate distention is the normal condition of the large intestine. If it is hyperdistended, it causes spasm and expulsion of material. The mucosa of the large intestine absorbs water with great rapidity. The retention of fluid in the colon depends entirely upon the method of its administration. We have visited hospitals numbers of times and have been shown patients who were receiving the "Murphy treatment." We should not have recognized it without the label. It is difficult to impress those administering it with the importance of details, notwithstanding that the best results are secured only by close attention to detail. A fountain syringe, to which is attached a three-eighths-inch rubber hose, fitted with a hard rubber or glass vaginal douche tip with multiple openings, was the medium originally used. The tube should be flexed almost to a right angle three inches from its tip. A straight tube must not be used, as the tip produces pressure on the posterior wall of the rectum when the patient is in the Fowler position. The tube is inserted into the rectum to the flexion angle and secured in place by adhesive strips, binding it to the side of the thigh so that it cannot come out; the rubber tubing is passed under the sheet to the head or foot of the bed, to which the fountain is attached. It should be suspended from six to fourteen inches above the level of the buttocks and raised or lowered to just overbalance hydrostatically the intra-abdominal pressure—i.e., it must be just high enough to require from forty to sixty minutes for one and one-half pints to flow in, the usual quantity given every two hours. The flow must be controlled by gravity alone and never by a forceps or constriction on the tube, so that when the patient endeavors to void flatus or strain the fluid can rapidly flow back into the can, otherwise it will be discharged in the bed. It is this ease of flow to and from the bowel that insures against overdistention and the expulsion onto the linen.

"The fountain had better be a glass or graded can, so that the flow can be estimated. The temperature of the water in the fountain can be maintained at 100° by casement in hot-water bags. The fountain is refilled every two hours with one or two pints of solution. In peritonitis the tube should not be removed from the rectum for two or three days, except for bowel movement. When the nurse complains that the solution is not being retained, it is certain it is not being properly given; even children tolerate proctoclysis surprisingly well. We have administered as much as thirty pints of salt solution in twenty-four hours and it was all retained. We believe that, next to the conservative technique of the operative procedure, proctoclysis is second in importance as a life-saver. It rapidly restores blood pressure, it improves the capillary circulation, it quiets the thirst, it eliminates the septic products and increases the excretions. All of the details are simple, but they must be carried out with precision to secure the best results."

It is not necessary to have an elaborate apparatus. Dr. Murphy accomplished a large part of his splendid results by a simple fountain syringe properly arranged. The treatment can be more conveniently and accurately carried out, however, with an apparatus especially adapted to the work.

The *double-tube apparatus* is the most convenient kind and the one generally employed in hospital work. In this form of apparatus there is an extra tube connected directly with the column of fluid entering the rectum (see Fig. 884). This extra tube takes care of escaping gas and of all back pressure imparted to the fluid in the rectum by straining, coughing, etc. This arrangement permits a clamp and dropper to be placed on the tube below the can of fluid for regulating the flow. This adds greatly to the accuracy and convenience of administration. Care must be taken, however, to avoid the common mistake of placing the clamp and dropper below the junction of the extra tube. Such a faulty arrangement prevents the escape of gas and of back-pressure fluid just the same as a clamp applied to the tube of the single-tube apparatus.

The *single-tube apparatus* has only one tube, which is connected at one end with the solution container and at the other end with the rectal nozzle (Fig. 885). The most common form of this apparatus is the ordinary fountain syringe, which does very well when properly managed. In every single-tube apparatus the rate of flow should be regulated entirely by the height of the container. Any clamp or dropper placed on the tube prevents the escape of gas or fluid from back pressure. The lumen of the tube should be unobstructed so that fluid may flow freely back to the container when there is back pressure from straining, coughing, vomiting, etc. Obstruction in the tube is very often responsible for unsatisfactory retention of the fluid and it is well to examine in regard to this point when the nurse reports that the patient cannot retain the fluid.

The rate of flow must of course be adjusted to the patient's ability to absorb the fluid. Ordinarily a rate of flow of 100 to 150 drops per minute will be satisfactory. That means about one pint an hour.

11. Local suppuration. This is indicated by fever, coming on after the sixth day, and a moderate increase in the pulse rate and localized pain. If the suppuration is *deep in the pelvis,* the patient complains of deep-seated pain and usually of backache or of pain extending down one thigh. If the inflammatory

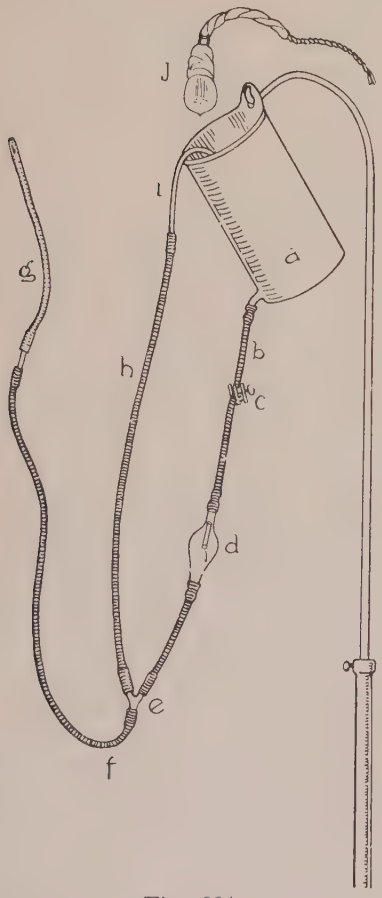

Fig. 884.

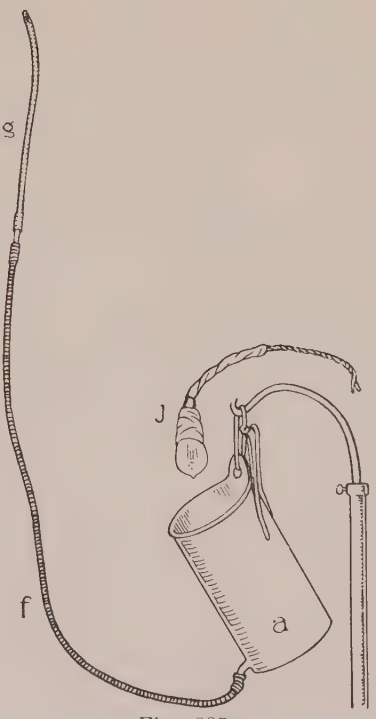

Fig. 885.

Fig. 884. The Double-tube Apparatus for Proctoclysis: *a,* the container for saline solution; *b,* tubing from the container *to* the dropper; *d,* the dropper; *e,* a glass Y; *f,* tubing from the Y to the rectal tube (catheter) *g, h,* the tube which provides for the escape of gas and of fluid from back pressure; *i,* metal or glass tubing in the form of a hook for hanging on the edge of the container; *j,* an ordinary electric light and socket which has been securely wrapped and cemented to make it waterproof, for keeping in the saline solution to maintain the heat of the same. The solution must be watched by the nurse to see that it does not become hot enough to burn the patient. This accident has happened several times, once in the experience of the author. The tube came unjointed near the rectum and the solution, which was too hot, burned the patient, even to the second degree at some spots.

Fig. 885. The Single-tube Apparatus for Proctoclysis: *a,* the container for the solution; *f,* tubing from the container to the rectal tube; *g,* the rectal tube; *j,* the waterproof light bulb for heating the solution. In the single-tube apparatus, as there is no other provision for the gas or back-pressure fluid, they must pass along the primary tube back to the container. Consequently there must be no clamp or dropper or other obstruction on the tube, and the rate of flow is to be regulated entirely by the height of the container, as explained in the text.

focus is situated in the back part of the pelvis, bowel movement or the giving of an enema causes pain. Vaginal examination shows a boggy mass, which is very tender. The treatment for such local inflammation deep in the pelvis is to secure good bowel movement, to make the patient comfortable, to increase tissue resistance, and to await resolution or abscess formation. When fluctuation can be detected by vaginal examination, open and drain the abscess per vaginam. Exceptionally, it may be advisable to open into a solid mass (inflammatory focus without fluctuation) or to open into the culdesac for general pelvic drainage. Bacterin treatment employed promptly may aid materially in securing resolution before the suppurative stage is reached.

When the suppuration is in the *abdominal incision,* there is increasing pain along the course of the incision. This calls for removal of the dressing and inspection of the wound. Inflammation there is indicated by the cardinal signs (pain, heat, redness and swelling), localized at some part of the incision or extending all along it. If the disturbance is slight, a hot moist antiseptic dressing, changed every twenty-four hours, may be sufficient. If there is a pronounced cellulitis at some point, that portion of the wound should be opened superficially and a gauze or tube drain put in and the hot moist dressing applied. If drainage of the infected area can be satisfactorily effected without removing the tension sutures, that is preferable. In some instances the inflammation is confined to the subcutaneous tissue and no disturbance of the deep buried sutures is necessary. The important point, however, is to secure free drainage of the infected area and prevent serious absorption. If the whole wound is infected it must all be drained. In such a case the whole wound, except the peritoneum, is likely to open. As soon as serious absorption has ceased, the sides of the wound are brought together by strapping with adhesive strips, the wound being exposed and cleansed with hydrogen peroxide every day or two, depending on the amount of discharge. Later, if thought preferable, the granulating surfaces may be freshenened by curetting and then brought together by sutures, with the idea of securing secondary union. Usually, however, firm strapping of the wound as it gradually heals is sufficient to produce a strong scar.

12. Phlebitis. This seldom occurs now, since patients are gotten out of bed early. When it does appear, it is usually in about the third week, when the patient has passed the time for the ordinary operative complications and is congratulating herself that she will soon be entirely well.

She complains of pain in the groin and upper part of the thigh on one side, and the temperature gradually rises to 102° or 103°. There may or may not be swelling of the foot and leg but there is always tenderness on pressure over the femoral vessels just below Poupart's ligament. This tenderness may in some cases be traced a considerable distance down the thigh, and also up along the iliac vessels.

The treatment of phlebitis is immediate bandaging of the leg and thigh from toes up, elevation of the leg in a comfortable position on pillows, and the maintenance of this position and of the dorsal posture for several days. In mild

cases the measures mentioned usually relieve the spontaneous pain, but in the severe cases sedatives may be necessary for a time to give rest.

It will be necessary to maintain this position most of the time for a week or more, depending on the severity of the trouble and the rapidity of the improvement. When the above treatment is carried out promptly and persistently, serious trouble seldom results. If the patient is permitted to use the leg, the suffering is increased and the disability prolonged, and there is danger of serious embolism by particles detached from the thrombosed area in the vein and carried to the brain or heart or lungs. On account of the danger of detaching emboli, no massage or rubbing of the involved area is permissible until some time after all acute symptoms have subsided.

Getting patients out of bed early (in seven to ten days) has almost eliminated this complication, while under the old regimen of keeping the patients in bed three weeks it was rather frequent, occurring in about two per cent of the abdominal operative cases.

13. Pain during convalescence. Aside from the conditions already mentioned and the natural soreness of the recently disturbed structures, pain during convalescence is usually due to gastric or intestinal indigestion with gas formation and resulting painful intestinal peristalsis. The treatment for this condition is to remove the irritating material from the intestinal tract by an enema and laxatives, and, if necessary, administer some remedy for the gastric or intestinal indigestion. Of course, operated patients are subject to neuralgic and neurasthenic pains the same as other individuals, and these are likely to be more pronounced at the menstrual time.

An abdominal operation often causes the menstrual flow to appear ahead of time. Not infrequently there is also a slight bloody flow from the uterus, without any relation to menstruation, within a few days after the operation. Such need occasion no alarm, as it disappears in a short time.

14. Subsequent disturbances. As the patient begins to walk about, there may be more or less **soreness** in the pelvis for some time, until the hyperemia of the healing tissues has disappeared and the new connective tissue is firm.

In drainage cases a **sinus** sometimes persists. The persistence of such a sinus may be due to sloughing tissue or to a ligature. In the case of a catgut ligature or sloughing tissue, the troublesome material will usually disintegrate and come away in the course of some weeks. The sinus in the meantime should be kept clean by frequent cleansing with hydrogen peroxide—every day or two, depending on the amount of discharge. The patient can care for the fistula at home after being shown how to apply the peroxide and the dressing.

If a silk ligature is at the bottom of the sinus, it may come out itself after some weeks or months, or it may have to be taken out. Sometimes it may be caught up by "fishing" with a silkworm-gut loop or other contrivance. Otherwise it must be removed by operation. A rare cause of persistent sinus is a sponge or forceps left in the cavity.

Occasionally a **fistula** connected with the bowel follows abdominal section Ordinarily such fistula should be treated by simple cleansing for some time, for in a considerable portion of the cases it will heal spontaneously within a few weeks. If it persists indefinitely, operative treatment is required. Such an operation should not be undertaken lightly, for it may prove very difficult and dangerous. A fecal fistula due to tuberculosis or cancer may persist indefinitely, and the chance of operative closure is slight.

A **hernia** in the scar indicates defective healing of the wound. This is usually due to the necessity for drainage, which prevents perfect approximation of the sides of the wound. If the hernia is small, it may in some cases be held back satisfactorily by an abdominal supporter. If large, or if persistently troublesome even though small, it requires operative treatment.

The **nervous disturbances** coming after removal of the ovaries, like those seen in the natural menopause, are of two types, (a) the vasomotor symptoms from endocrine disturbance and (b) the incidental psychoneuroses. The *vasomotor* disturbances, consisting of hot flushes, dizziness, cold extremities and erratic variations of feeling, occur in the great majority of cases. They last usually two to three months and are not a serious matter. They are not due to increased blood pressure, for often it is not increased. General irritability of the nervous system may prolong them, as may also local disturbance. Graves has noted that complicating hernia, adhesions and especially prolapse of the cervical stump and vaginal walls, have this effect. These vasomotor disturbances are due to the cessation of ovarian internal secretion, and corpus luteum or ovarian tissue is a specific for them. Where both ovaries have been removed, it is well to begin giving corpus luteum while the patient is still in the hospital and to continue it off and on for several months. If ordinary administration does not secure sufficient effect, hypodermic administration later is advisable.

The *psychoneuroses* are not due definitely to loss of the ovaries, but to the general condition of the nervous system and especially to the exhaustion of long-continued disease. The operation usually improves these disturbances by checking the exhausting influence. In some cases, however, the additional strain of operation aggravates the symptoms temporarily. This temporary aggravation is likely to be increased or prolonged if persistently painful complications develop. A like prolongation may be caused in receptive individuals through mental suggestion occasioned by the remarks of friends as to the effects of such operations. These disturbances require psychoneurotic treatment, the same as when occurring unassociated with pelvic operation.

CHAPTER XVII.

VAGINAL OPERATIONS.

Vaginal operations include repair of the pelvic floor (perineorrhaphy); repair of the cervix (trachelorrhaphy); operations for cystocele, rectocele, vesico-vaginal fistula and various conditions about the vaginal outlet; anterior and posterior vaginal section; certain operations for retrodisplacement of the uterus; and removal of the uterus and other structures by way of the vagina.

PREPARATIONS.

The preparations for vaginal operation may be divided into preparation of the patient, preparation of instruments and dressings, preparation of operator and assistants, and the special points in anesthesia.

Preparation of Patient.

General preparation. The general preparation of the patient for a vaginal operation is practically the same as for an abdominal operation.

Local preparation. The patient receives an antiseptic douche one to three times daily, depending upon the amount and character of the discharge. The afternoon or evening before operation the external genitals and adjacent surfaces are shaved. This obviates shaving on the morning of the operation, when the nurses are usually very busy and when the shaving would break into the patient's early rest. Again, all the preparation should be completed at least half an hour before operation, as undisturbed quiet is necessary to secure full effect from the pre-anesthetic sedative.

When the patient is on the operating table and anesthetized, if an anesthetic is to be given, the external genitals and interior of the vagina are cleansed thoroughly with green soap and warm water, using gauze or cotton balls. Picric acid solution (5 per cent solution in alcohol) is then applied to the external genitals and to the adjacent portions of the operative field and to the vagina. If preferred, iodine solution (3 per cent) may be used, but it is so irritating to the vaginal mucosa that it must be partially removed with alcohol immediately after application. The author much prefers the picric solution. Some operators may prefer to use bichloride solution (1-2000) or lysol solution (two per cent) after the soap-water cleansing.

In complicated or doubtful cases, where it is possible that an abdominal operation may be required, the patient should of course be prepared also for abdominal section.

Preparation of Instruments and Dressings.

The preparation of instruments, sutures, gowns, dressings, etc., is the same as for like articles for an abdominal operation.

In vaginal work the continuous gauze-strip sponges are not necessary. Numerous small gauze sponges are required, and cotton balls, also, should be at hand, for use especially in curettage. In hysterectomy and in vaginal section, one or two large flat gauze sponges, with a long tape attached, should be provided for introducing into the pelvis to hold the intestines out of the way.

In vaginal operative work the author has found it convenient to have three lists of instruments. One list specifies the instruments needed for curettage and

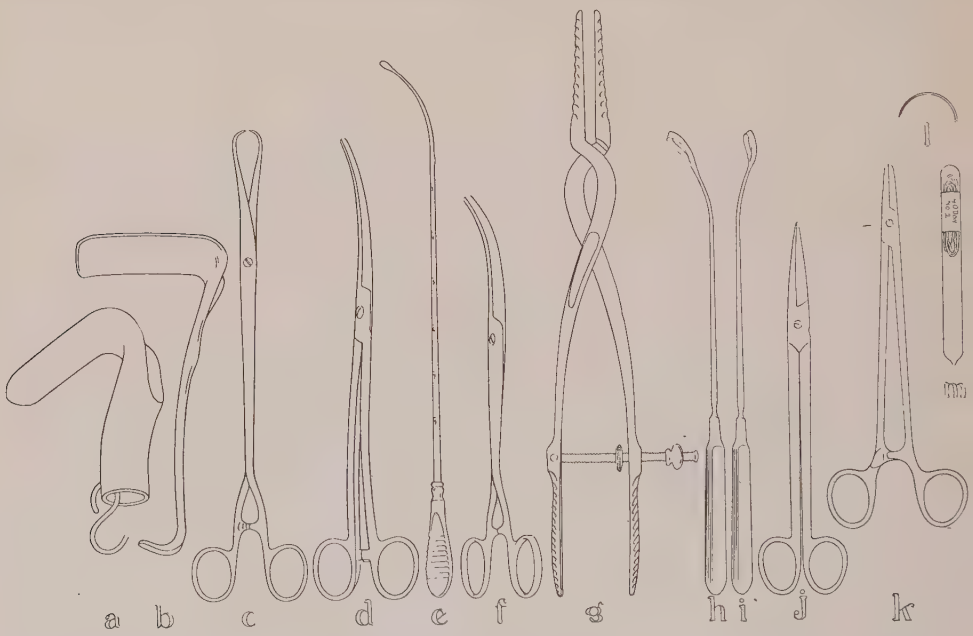

Fig. 886. Instruments for Curettage and Excision of Specimen: *a*, self-retaining speculum; *b*, large retractor; *c*, uterine tenaculum-forceps (two); *d*, uterine dressing forceps; *e*, uterine sound; *f*, curved clamp, to be used as small dilator; *g*, large dilator; *h*, sharp uterine curet, bent for curetting anterior wall; *i*, sharp uterine curet, bent for curetting the posterior wall; *j*, sharp-pointed uterine scissors, for excising specimen from cervix uteri if necessary; *k*, needle holder; *l* and *m*, curved cervix needles (two) and suture material for use, if needed, in closing the wound made by excision of a specimen from the cervix.

excision of a specimen from the cervix and radium application to cervix or within uterus. Another list specifies the instruments needed for repair of the pelvic floor or repair of the cervix or simple vaginal section for drainage and similar procedures. The third list specifies the instruments needed for vaginal hysterectomy or myomectomy or adnexal work. The lists are given below and the instruments are illustrated in Figs. 886, 887, 810 and 486. The self-retaining speculum is convenient where help is limited. In the hospital, where there are plenty of assistants, the author finds the simple vaginal retractors more convenient.

For Curettage and Excision of Specimen and Radium Application.

1 Self-retaining speculum, if desired.
2 Vaginal retractors (small and large).
3 Flat spatula retractors.
2 Uterine tenaculum-forceps.

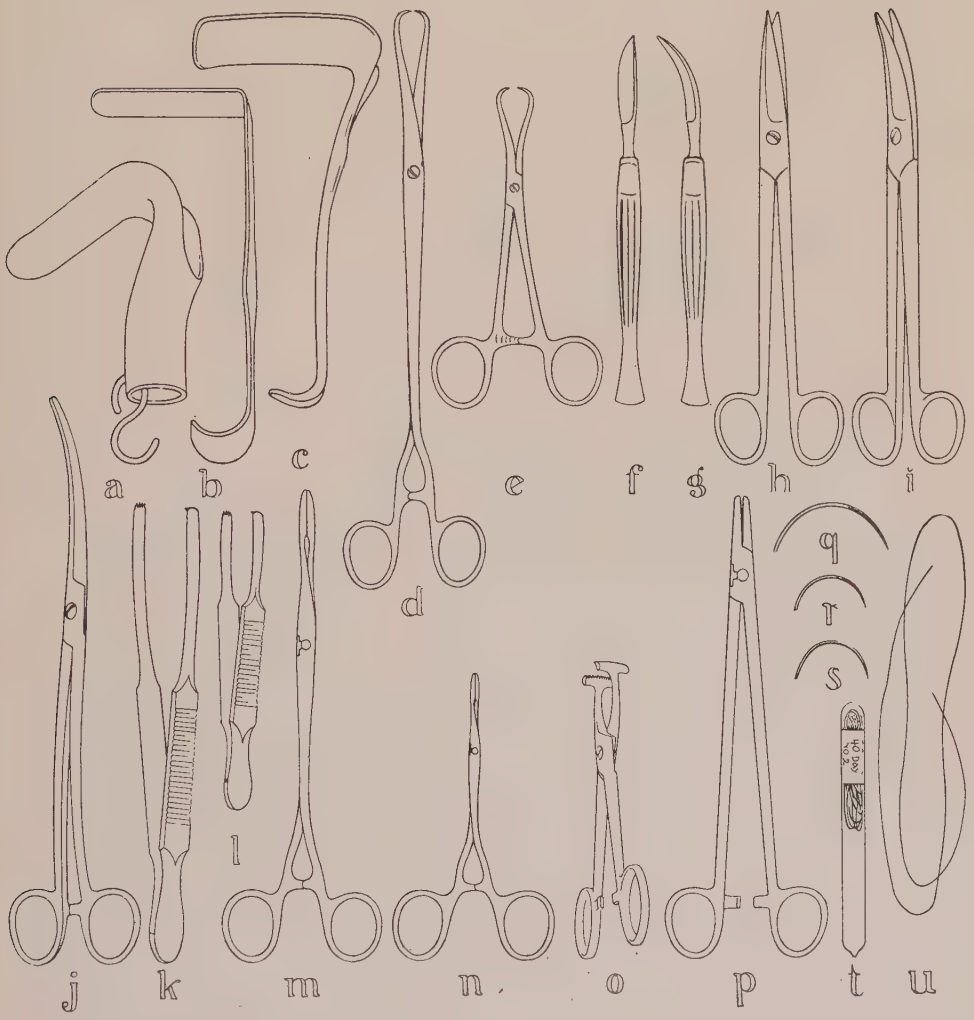

Fig. 887. Instruments for Perineorrhaphy, Trachelorrhaphy and Amputation of the Cervix: *a*, self-retaining speculum; *b*, small retractor (two); *c*, large retractor; *d*, uterine tenaculum-forceps, for perineal work, (six); *f*, scalpel; *g*, curved bistoury; *h*, straight sharp-pointed uterine scissors; *i*, curved sharp-pointed uterine scissors; *j*, uterine dressing forceps; *k*, long, toothed dissecting forceps; *l*, short, toothed dissecting forceps; *m*, long artery forceps, which may be used also as sponge-holders, (four); *n*, short artery forceps (six); *o*, T-forceps, for catching flaps in perineal work, (two); *p*, needle holder (two); *q*, large full-curved cutting needle (two); *r*, curved cervix needle (four); *s*, small curved round-pointed needle, for deep suturing in the perineal work, (four); *t*, No. 2, 40-day catgut (six tubes); *u*, black silkworm-gut (twelve strands).

2 Uterine dressing forceps.
1 Uterine sound.
1 Long curved clamp, to use as small dilator.
1 Large dilator.
2 Uterine curets.
1 Uterine scissors.
Special scissors for cervix are convenient (Fig. 334).
1 Needle holder.
2 Curved needles.
1 Tube of catgut.
Put in stem-pessaries if required.

For Perineorrhaphy or Trachelorrhaphy or Amputation of the Cervix.

1 Self-retaining speculum, if desired.
4 Vaginal retractors (different sizes).
2 Long tenaculum-forceps.
6 Short tenaculum-forceps.
1 Scalpel.
1 Bistoury.
1 Uterine scissors, straight, sharp-pointed.
1 Uterine scissors, curved, sharp-pointed.
Special scissors for cervix are convenient (Fig. 334).
2 Uterine dressing forceps.
1 Long dissecting forceps, toothed.
1 Short dissecting forceps, toothed.
4 Long artery forceps, which may be used also as sponge holders.
6 Short artery forceps.
4 Short T-forceps for holding perineal flaps.
2 Needle holders.
2 Large curved surgical needles.
6 Cervix needles (small and large).
4 Small curved round-pointed needles.
4 Tubes of catgut, 40-day.
12 Strands of silkworm-gut.
Put in additional instruments for dilatation and curettage if that is required (Fig. 886).

For Vaginal Hysterectomy or Myomectomy or Adnexal Work.

Use the preceding list and add the following:
6 Curved clamps (Fig. 810,l).
6 Straight clamps, toothed (Fig. 810,m).
1 Long vaginal retractor (Fig. 810,k).
2 Double tenaculum-forceps (Fig. 810,p).

2 Three-pronged tenaculum-forceps (Fig. 810,q).
1 Pedicle-needle (Fig. 810,t).
6 Pryor's clamps (Fig. 486).

Preparation of Operator and Assistants.

The preparation of operator and assistants is the same as for an abdominal operation.

TECHNIQUE AND INDICATIONS.

The technique of and indications for the various vaginal operations have already been considered under the particular diseases for which they are required. For curettage, see Figs. 376 to 383. For excision of a specimen from the cervix for microscopic examination, see Fig. 333. For repair of the pelvic floor, see Figs. 248 to 263 and 278 to 289. For operation for vaginal fistulæ, see Figs. 308 to 332. For repair of the cervix, see Figs. 342 to 375. For vaginal hysterectomy, see Figs. 455 to 486. For vaginal myomectomy, see Figs. 487 to 504.

VAGINAL SECTION.

It may be well to consider vaginal section somewhat in detail in order to bring out its advantages and disadvantages as compared with abdominal section.

Vaginal section is incision through the vaginal wall into the peritoneal cavity. If the entrance is made behind the cervix, it is known as "posterior" vaginal section. If the opening is made in front of the cervix, it is known as "anterior" vaginal section.

Steps.

The steps in the operation are essentially the same as for abdominal section, changing the field from the abdominal surface to the depths of the vagina. The steps are:

1. Exposure of operative field by suitable retractors.
2. Incision and entrance into the peritoneal cavity.
3. Exploration.
4. Correction of pathological conditions.
5. Restoration of structures to approximately normal relations.
6. Closure of incision or drainage, as thought preferable in that particular case.
7. Dressing.

The steps of vaginal section are illustrated in Figs. 100 to 105 and 119 to 128.

Advantages.

In some cases of pelvic disease it is better to enter the peritoneal cavity from below, i. e., by vaginal section; while in other cases it is better to enter from above, i. e., by abdominal section.

The advantages of vaginal section, in suitable cases, are as follows:

1. Less danger. There is less exposure and handling of the intestines and peritoneum. In vaginal section the manipulations are nearly all in the pelvic cavity, while in abdominal section the central portion of the great peritoneal sac is invaded; therefore, in vaginal section there is less shock and less danger of general peritonitis. Again, if infection should develop after vaginal section, it is very likely to be "walled off" from the general peritoneal cavity and to cause simply local suppuration, whereas when infection appears after abdominal section it is very likely to take the form of an acute general peritonitis.

2. Evacuation of pus without contamination of peritoneal surfaces. This is one of the strongest points in favor of vaginal section in suitable cases. As a rule, when there is a large collection of pus that can be reached from below, it should be evacuated that way. This is particularly important if the pus be of recent origin. In such a case it is very important to prevent soiling of the peritoneal surfaces with this infectious fluid. This is accomplished by opening from below.

Again, in many cases of pelvic suppuration the pelvic cavity, containing the abscess, is entirely shut off from the general peritoneal cavity by a wall or roof of inflammatory exudate, which binds together the upper pelvic structures. When operating from below we work beneath this roof, which protects the general peritoneal cavity from contamination.

3. Better drainage. In vaginal section the opening is made at the lowest part of the pelvic cavity—the best place for drainage.

4. Quicker convalescence. There is less disturbance of the intra-abdominal structures. Also, the wound is smaller, better protected and supported by surrounding parts, and is not so likely to be followed by hernia.

5. No visible scar. This is of some importance. A scar marking the site of a former opening into one's interior is not particularly pleasant for the patient to contemplate. It is an ever-present reminder of the disease that was present and of the operation. It is well to avoid making such a scar in cases where other methods are just as good.

6. Vaginal section combines easily with certain plastic operations, which are sometimes indicated at the same time.

Disadvantages.

The disadvantages of the vaginal section are:

1. Lack of room in the operative field. The manipulations are cramped and are carried out with less certainty of accomplishing the desired result.

2. Imperfect exploration of pelvis and lower abdomen. The pelvic structures are reached with greater difficulty and the lower abdominal structures (appendix, etc.) cannot be satisfactorily reached at all. And of the structures examined, the determination of their condition must be usually made largely through the

sense of touch, for in many cases the structures can be only imperfectly exposed to sight.

3. Remnants remain. Where the adhesions are extensive there is likely to be imperfect work unless the uterus is removed, and in many cases it is not advisable to remove the uterus.

4. There is not so good a chance to determine whether or not the conditions are favorable for conservative work on the ovaries or tubes, and the work itself, when indicated, cannot as a rule be so satisfactorily executed.

5. Appendix affections cannot be satisfactorily handled. The appendix is diseased and requires removal in a considerable proportion of patients with pelvic disease.

Selection of Cases.

The operative cases in which the author considers the *vaginal operation preferable* to the abdominal are:

1. Acute infection in the pelvis that has not yet spread to the general peritoneum. This acute severe pelvic peritonitis is seen principally in cases of sepsis following labor or abortion. If general peritonitis is present, abdominal section is preferable.

2. A collection of pus low in the pelvis within easy reach of the fingers, particularly if there is a probability that the general peritoneal cavity is well walled off above.

3. For exploration of the pelvis in certain doubtful cases in which it is evident that all the information required can be determined from below.

The operative cases in which the author considers *abdominal section preferable* to vaginal section include:

1. Chronic inflammatory lesions of the adnexa, with or without a collection of pus.

2. Cases of adherent retrodisplacement of the uterus.

3. Cases in which conservative work on ovaries or tubes is probably required.

4. Ovarian and broad-ligament and uterine tumors (except certain myomata that can be satisfactorily removed from below).

5. Extrauterine pregnancy (except where all that remains is a walled-off hematocele).

6. Cases complicated with, or probably complicated with, appendix trouble.

7. Obscure cases, requiring thorough examination of the pelvis and lower abdomen.

AFTER-TREATMENT.

The general after-treatment of vaginal operations is practically the same as for abdominal operations.

Gauze extending from the vagina into the peritoneal cavity is removed usually in three or four days. In the case of an abscess cavity, a rubber tube, arranged

as previously explained (Figs. 617 to 619), is preferable to gauze. After the gauze packing is removed, a cleansing douche of normal saline solution or an antiseptic solution is given once or twice daily, dependng on the amount of discharge. If the peritoneal cavity has been opened, care must be exercised to see that the douche is given under very low pressure and that there is no obstruction to the outflow from the vagina.

After a vaginal or perineal operation the vulva and adjacent surfaces must be kept covered with an antiseptic dressing, the same as any other wound region. Here, however, on account of the necessity of evacuation of the bowel and bladder, the problem of wound protection is more complicated. The dressing must be changed several times daily and with each change of dressing there is danger of contamination.

When it is necessary to change the dressing, the nurse should disinfect her hands and then cleanse the operative field with an antiseptic solution (e. g., bichloride 1-5000). The cleansing may be conveniently accomplished by means of the "pitcher douche." After the cleansing a fresh dressing is put on and the T-bandage again applied.

If the patient can pass the urine, she should ordinarily be permitted to do so, whatever the character of the vaginal work. Catherization is more likely to do harm than urination is, especially as the urine remaining on the genitals is at once removed by the cleansing solution. To aid spontaneous urination, the patient may be propped up, hot packs on the vulva may be used, and also firm pressure may be made over the bladder as the patient is trying to urinate. Hot douches also aid some, and may be used if there is no contraindication.

In many cases, however, the patient cannot urinate at first, and must be catheterized for two or three or more days. Catheterization must be carried out under strict antiseptic precautions. The catheter is boiled, the nurse's hands are disinfected, and the vestibule and meatus of the patient are carefully cleansed with an antiseptic solution. After the labia are once separated and the vestibule cleansed, the labia must be kept separated, so that there is no recontamination of the vicinity of the meatus, until the catheter is introduced. Care should be taken to avoid touching the part of the catheter which enters the bladder. The catheter should be grasped well back from the point. In order to prevent cystitis, it is well to give the patient some reliable internal urinary antiseptic while she has to be catheterized and for several days after the urine is passed spontaneously. An additional precaution is to have the bladder irrigated with three per cent boric acid solution once or twice daily while catheterization is necessary. After spontaneous urination returns, catheterization once daily immediately after urination should be carried out until all residual urine disappears.

The special points in the after-care in the various vaginal operations have already been given in the chapters treating of those operations.

CHAPTER XVIII.

GYNECOLOGIC SURGERY IN NERVOUS PATIENTS.

This subject brings us at once into the midst of one of the hardest problems connected with diseases of women. The interrelation of the genital system and the nervous system is most complicated, and the commingling of symptoms from the two produces a haziness or blurring of the clinical picture that often prevents clear delineation in diagnosis and in treatment.

In discussing this very practical subject, the author will endeavor to avoid speculative and theoretical considerations, and will as far as possible, confine his remarks to demonstrated facts. There are two important points that must be kept in mind in any consideration of this class of patients.

1. Some of the time-honored and generally-accepted notions concerning pelvic reflex disturbances have been shown by careful investigation and observation to have no basis in fact.

2. There is still a large unknown zone in this field. This unexplored zone is a most interesting and inviting one, and into it investigators are pushing from all sides—the gynecologic, neurologic, pathologic and physiologic. Particularly the widespread investigation into physiological chemistry (hormones, secretins and "internal secretion" in general) gives promise of a chemical basis and explanation for many of the phenomena heretofore classed under that hazy term "reflex nervous disturbance."

Grouping of Cases.

Leaving aside the general features of the subject, with the attractive theories and working hypotheses connected therewith, let us pass at once to the practical points in the care of these patients, as they come to us for relief.

In handling gynecologic patients with nervous symptoms, or nervous patients with gynecologic symptoms, the author has found it convenient, for purposes of treatment and prognosis, to group them roughly into the following classes:

I. Malnutrition Group. In the cases of this group the nervous phenomena are due to malnutrition, and aside from this there is no definite disease of the nervous system. The symptom-complex, though variable, corresponds in a general way with that described in neurologic works under the term neurasthenia (nerve exhaustion). In severity, the nervous disturbance may vary all the way from a slightly annoying irritability to a complete and prolonged breakdown. This class comprises several subgroups, as follows:

1. The malnutrition is due wholly to the pelvic lesion. The pelvic lesion is the main trouble, the nervous disturbance being secondary and due to the depres-

sion of the general health by the pelvic disease. A marked nerve exhaustion, with its varied and distressing symptoms, may result directly from and be a part of the general malnutrition due to any of the exhausting pelvic diseases, such as chronic pelvic suppuration or persistent blood-loss from uterine myoma or carcinoma or excessive menstruation.

This subclass includes also those cases in which there is direct interference with the function of vital organs by pressure or constriction, as when a tumor or inflammatory mass narrows a ureter so much as to cause backward pressure in the kidney, or where adhesions damage the adjacent bowel by seriously narrowing its lumen or interfering with its peristalsis. It includes all those cases in which the pelvic lesion causes such severe pain or such persistent pain that the patient's sleep and appetite and digestion are seriously disturbed, with resulting malnutrition.

In the patients of this class the nervous phenomena are due wholly to the malnutrition, and the malnutrition is due to the pelvic lesion. This is a large class, and as a rule easily recognized.

The treatment is clearly indicated—that is, remove the pelvic lesion. If the malnutrition is far advanced it may be necessary to build the patient up some before operating. But the main point is to remove the pelvic lesion as soon as it may be done safely.

The prognosis in these cases is good, providing the patient receives the proper tonic regime after immediate convalescence from the operation. The nervous disturbances, being due to the malnutrition, disappear as the nutrition of the patient is restored, though treatment for many months may be required.

2. The malnutrition is due partly to some other lesion or lesions. There may be a serious lesion of the kidneys or liver or gastro-intestinal tract or heart or lungs, etc. This group, also, is a common one and includes many patients. It is also a group in which physicians have, in many instances, "fallen down" pretty hard, because of neglect of the precaution to subject the gynecologic patient to a careful general examination. It is very easy, on finding a well-marked pelvic lesion, to jump to the conclusion that that is the cause of all the patient's trouble. This may lead to a mistake in the treatment, the patient perhaps being subjected to operation when she is in no condition for it. This mistake in diagnosis may lead also to an erroneous prognosis—the disturbance from the overlooked extragenital disease persisting in spite of the removal of the pelvic lesion.

3. The malnutrition is due not at all to the pelvic lesion, but wholly to some other lesion or lesions. Troublesome nervous disturbance may be due to malnutrition from any cause, and the simple fact that there is a pelvic lesion does not establish that as the cause of the symptoms. Here, again, is apparent the necessity for a careful general scrutiny of gynecologic patients if accuracy in treatment and prognosis is to be secured. In several instances patients have been sent to the author for operation for a uterine fibroid or retrodisplacement or prolapse, with the idea of relieving a serious general debility, which was wholly independent of the pelvic lesion. Of course, under certain circumstances, any one of

these lesions may be directly responsible for serious interference with the general health. However, that causative relation must not be taken for granted simply from the presence of the lesion; but the measure of responsibility of the pelvic lesion for the chronic invalidism must be established by careful critical investigation.

4. The malnutrition is not due to any definite lesion, pelvic or otherwise, but to persistently recurring suffering at the menstrual time. This regularly recurring suffering produces the malnutrition through its interference with sleep, digestion, exercise and the general normal activities of the body. Also, the constant dread of the next period has a depressing mental effect which necessarily influences nutrition. The certainty of having to pass through a period of severe suffering, lasting from several days to two weeks, and repeated every month indefinitely, would have a marked influence on a well person, and much more on a frail woman, weak and debilitated from the actual suffering and blood loss and physical depression of the abnormal menstruation. Consequently in the short period when there is no pain, the patient's recuperation is retarded by the worry and the dread of the suffering she knows will come again in a short time. This process may keep on until the patient is wholly disabled and presents the symptoms of complete nervous prostration. This is, of course, a picture of the extreme cases—not of ordinary dysmenorrhœa, in which the patient suffers some for one or two days and is all right the remainder of the month. Such dysmenorrhœa produces no marked malnutrition in a normal individual. It simply means rest and medicinal treatment for a short time each month. But the severe cases are different, and the debilitating process may go on until the individual becomes a physical and nervous wreck—a burden to herself and a source of pity to her friends.

If any distinct lesion is present the debility is likely to be attributed to that, ignoring the fact that it can be due to persistently recurring pain independent of any lesion. Long ago, when double oöphorectomy was in vogue for all sorts of nervous affections, the occasional brilliant result secured, came, probably, in just this class of cases. And the result was due, not to the cure of some systemic disease of the nervous system through the occult influence of removal of the ovaries, but through the cessation of recurring menstrual torture, which gave the patient a chance to regain normal nutrition and health. Oöphorectomy for genuine nervous disease was soon given up, because it was found that it did not cure such diseases, but on the other hand, sometimes made the patients much worse by depriving them of the normal ovarian influence. But it is recognized that in just the class of cases under consideration, double oöphorectomy is occasionally justified, even in a young woman—of course, only as a last resort, and with full recognition of the risk that the beneficial effects of stopping the monthly suffering may be offset by the absence of the ovarian influence, attributed for the present to ovarian "internal secretion."

In some cases in which no decided lesion can be made out on examination, it will be found at operation that there is a marked cystic or other abnormal condition of the ovaries. Whether this is primary or secondary, it seems in some

cases to have a marked effect in prolonging and aggravating the dysmenorrhœa, as shown by the relief following removal of the ovaries or excision of the diseased portions.

II. The Neurologic-disease Group. In the patients of this group there is some definite disease of the nervous system (such as hysteria, chorea, epilepsy, melancholia, general or local neuritis, cord lesions, etc.), or there is that inherent instability of the nervous system comprised under the term "neurotic." In this group also there are several subgroups, and these subgroups must be kept in mind if we are to have a clear understanding of the relations of the gynecologic and neurologic features of these cases.

1. The pelvic lesion is serious and is depressing the general health, by *blood-loss or toxic poisoning,* and in that way is aggravating the nervous trouble. In this class come those patients with bleeding fibroids, excessive menstruation, chronic pelvic suppuration, etc., associated with some well-marked disease of the nervous system.

2. The pelvic lesion has no influence on the general nutrition, by way of toxins or blood-loss, but causes *persistent pain or dragging or distress,* and in that way aggravates the nervous disease. Thus the pelvic disease may contribute much to the severity of a functional nervous disease, in addition to causing direct local distress.

3. There is a pelvic disease which is not causing local trouble at present, but *knowledge of its presence* keeps the patient in a state of constant apprehension and thus aggravates the nervous disturbance.

4. There is a pelvic lesion that is having *no deleterious influence,* either local or general. In these cases the patient's serious trouble is outside the pelvis (partially or wholly in the nervous system), and is not even aggravated by the pelvic abnormality. In such cases it is as a rule best that the patient be not informed of the pelvic lesion, though the condition should be explained to a responsible relative.

5. There is no definite pelvic lesion, but *severe dysmenorrhœa* and serious aggravation of the nervous disturbance with each menstruation. This is a large class, but the cases are for the most part of only moderate severity. Occasionally a patient of this class will present extreme menstrual suffering extending over a long period and so interfering with her general health that she cannot recuperate between periods, and hence eventually suffers a serious breakdown. It is in such cases of complicated nervous disease that benefit may follow cessation of menstruation—not because of any direct effect on the real nervous disease, but because it stops the monthly hyperirritation of the nervous system.

So much for the helpful subgrouping of the gynecologic patients comprising that large class designated as "nervous." The author's observation and study of this important class of patients has led him to the conclusion that the only certain and established method by which a pelvic lesion can affect the distant nervous system is (a) by depressing its nutrition or (b) by increasing its general irritability.

This has for some years been the key to his treament and prognosis in these cases. Not much credence is given to pelvic "reflex disturbances," as generally conceived. That there is much that is unknown is freely admitted, and it is conceded also that for some of these so-called "reflex" phenomena we have as yet no satisfactory explanation. Possibly the future will show that these distant phenomena are due to the action and interaction of hormones and other "internal secretion" products of the various organs. On the other hand, some other and better explanation may be brought to light. Until more definite information is at hand, the author prefers to base his operative treatment and prognosis in these cases upon the two above-mentioned established effects of a pelvic lesion upon the distant nervous system.

Classification of Individual Patients.

When a patient is once properly classified according to the above described grouping, the treatment and prognosis from the gynecologic standpoint is fairly clear, for the group-description itself suggests the same. The hard problem comes in identifying the individual cases—i.e., assigning the patient to the subgroup in which she properly belongs. Though this is in many cases a difficult and tedious task, it is well worth the time and labor spent on it, for it is the only way in which this difficult class of patients can be handled with ultimate success. These are the patients that go from physician to physician, with a multitude of woes and disappointments and censurings. Course after course of local treatment is taken, without the hoped-for benefit, and in some instances one or more operations have been added without the expected result.

Gynecologic investigation. When confronted with a "nervous" patient with gynecologic symptoms, it is well to proceed to the classification of the case by the following steps:

1. Make an accurate history and examination—so as to determine definitely (a) all the troublesome symptoms present and (b) the exact condition of the pelvic organs.

2. Consider how far the pelvic lesions themselves will rationally account for the symptoms. In the cases under consideration there will be found a considerable residue of symptoms not directly accounted for by the pelvic lesions.

3. Then comes the question as to what *does* cause this *residue* of symptoms. Are they such as can be accounted for by the malnutrition present? If so, what causes the malnutrition? Is it due to the pelvic lesion, or is it due to some accompanying disease of the kidneys or heart or lungs or liver, etc.? You see that by the time these questions are answered the general condition has been fairly well investigated.

4. If there is no marked malnutrition or if the extrapelvic symptoms are not clearly neurasthenic (fatigue symptoms), then comes the question, "Is there some genuine disease of the nervous system back of these extrapelvic symptoms?" In some cases the presence of a disease of the nervous system, and its character, is

apparent on cursory examination, while in other cases the determination of this point requires a painstaking investigation by a physican well versed in this department of internal medicine.

Neurologic investigation. How far one will go personally in the investigation in this direction, depends on the time at his disposal and on his interest and training in the field of systemic nervous diseases. As a matter of fact, the author sends all the difficult cases to some neurologist for a thorough investigation —either to clear up the diagnosis or to have an authoritative statement of the condition of the nervous system before subjecting the patient to the strain of operation, for in some neurologic conditions operation would be quite inadvisable.

In this connection a not unimportant item is the additonal expense incurred by this thorough neurologic examination—for sometimes a considerable period of observation and treatment by a neurologist is necessary in order to determine definitely the neurologic features of the case. Some of these patients have already been told that there is some nervous disease, or have surmised the same, and hence they welcome the suggestion of a thorough investigation of the nervous system by a specialist. Other patients see no reason for consulting a "nerve doctor," as they have been told that their symptoms are due to pelvic trouble, or having taken much medicine for "the nerves" without lasting benefit, they are convinced that their symptoms must come from the pelvis. A clear explanation will usually remove all objection to the required neurologic examination, particularly when the patient's attention is called to the fact that she has been treated for months or years with only temporary benefit and that it is time now to get to the bottom of the trouble.

Occasionally a patient will persistenly object to the neurologic investigation. In such cases, if the nervous symptoms are at all serious, it is well to refuse to operate. The author has done this in a few instances and has never regretted doing so. The nervous system may be in such a condition that the strain of operation would make the patient worse, and it might even precipitate a very serious breakdown. Again, it is just these unreasonable patients who expect too much from an operation and are dissatisfied afterward if not relieved from every symptom, whether or not such symptom has any rational connection with the organ operated on. When such an individual can be identified before operation the author prefers to avoid contracting for trouble.

Prognosis. The prognosis in the operative treatment of these gynecologic-neurologic patients, is indicated in a general way by the grouping already given. The rule that the author is guided by in prognosis is that the removal of the pelvic lesion will relieve the general nervous disturbance only in so far as that nervous disturbance is due to *malnutrition* or to *general irritation* of the nervous system dependent on the local irritant. That is, he is not ready to admit any specific influence by way of the nerves, of a pelvic lesion over that of a like lesion in any other of the important deep-seated organs. Investigations have shown that many of the organs of the body give into the blood specific substances having

definite general and local effects, and the ovary belongs to this group. But this product is physiological and is not due to a lesion. Furthermore, it is carried by the blood and not by way of the nerves.

Consequently, when asked how far the removal of a pelvic lesion will benefit a patient with some general nervous disease, the answer is, "As far as that removal will improve nutrition and allay general irritation." That is as far as we can safely go in prognosis in these cases at present. It is a fact that in some cases the results apparently go beyond this, and we may hope for these added results. But they are erratic, unreliable, obtained in some cases and not in others, and we cannot justly hold them out as an indication for operation. When the prognosis is based upon the safe plan above mentioned, if those uncertain good results follow operation, well and good, if not, the patient is not unduly disappointed.

CHAPTER XIX.

MEDICO-LEGAL POINTS.

There is not space here for a systematic consideration of the various legal questions that may arise in conection with gynecologic operative work. The author desires simply to call attention to certain pitfalls, in order to aid the surgeon in avoiding them. The following points will be considered:

1. Consent to operation.
2. Foreign bodies left in the abdomen.
3. Persistence of symptoms after operation.

CONSENT TO OPERATION.

Consent to operation for pelvic disease embraces two definite propositions —first, consent to the operation found desirable on examination and, second, consent to additional or different operative work that may be found necessary or desirable after the patient is anesthetized.

An adult patient of sound mind has the right to decide whether or not she will have a certain required operation. This is a self-evident proposition, and compliance with it would seem to be a perfectly clear-cut affair with no chance for a misunderstanding. However, serious misunderstandings have arisen on this point. In fact, in actual practice the question of consent to operation is not such a simple matter after all. There are many ramifications of the question in which too much or too little may be taken for granted, thus permitting misunderstanding.

The following quotation from an article by Taylor, of the New York Bar, published in the St. Louis Medical Review, 1905, presents an instructive discussion by an authority on this subject.

"Recent cases in court involving the question of consent to an operation have attracted considerable attention, and have been the source of discussions in the lay as well as the medical press, showing a danger, too little realized, to which the physician is constantly subjected.

"The physician must always bear in mind that before operating on a patient, consent to the operation is a legal prerequisite. It is only in approaching the questions of what constitutes consent and by whom consent is required to be given that he enters the realms of uncertainty.

"Ordinarily, when a patient, not knowing his real condition, places himself in the hands of a surgeon to be operated on, there is an implied consent to the operation which it may be found necessary to perform. The English court has gone further in finding such implied consent than have the American

courts. In the case of Beatty vs. Cullingworth, the patient, an unmarried woman who had placed herself in the hands of an eminent London surgeon for the purpose of having performed the operation of ovariotomy, said to the surgeon that if both ovaries were found to be diseased, he must remove neither. To this he replied, 'You must leave that to me,' which reply the patient denied hearing. Upon operating, both ovaries were found diseased and were removed. Upon trial, the judge charged the jury that the patient had tacitly consented to the operation, whereupon they returned a verdict for the defendant.

"The author of this article in commenting upon this case, more than five years ago, expressed the opinion that it could not be safely considered as an embodiment of the law of this country.

"We now have a case coming from one of the trial courts of Minnesota, which more than justifies the moderate expression of doubt that the English case would be followed in this country. Here the court swings to the extreme opposite end of the arc.

"In this case the physician was employed by the patient to perform an operation on his right ear. After the patient was placed under the influence of anesthetics, the physician, so his testimony shows, made a more complete examination than he was before able to do and found that the left ear was more seriously diseased than the right ear, and he therefore operated on the left ear instead of the ear which he had originally intended to operate on. The theory of the patient's case was that the physician inadvertently operated upon the wrong ear. The trial judge instructed the court that no consent to operate on the left ear could be implied from the circumstances of the case and that the physician was therefore liable for damages for a technical assault Whereupon the jury rendered a verdict for more than fourteen thousand dollars.

"This verdict was, upon motion, set aside on the ground that the damages as assessed by the jury were excessive. The setting aside of the verdict does not, however, affect the ruling of the court upon the question of law as to liability of the physician in such a case. The effect of this ruling is admirably expressed by the New York Sun in an editorial as follows: 'The case as it stands is a judicial declaration to the effect that where a patient expressly consents to a specified surgical operation, or an operation on a specified organ, the surgeon cannot perform a different operation, or operate on a different organ, without rendering himself legally liable to respond in money damages to the patient.'

"It may well be doubted whether the courts of this country generally will follow the extreme view of the Minnesota trial court. [In the subsequent trial an entirely different view of the case was taken—see a later quotation.] It seems that the better rule would be that, in all cases of doubt, the question of whether or not a patient had given tacit consent to the performance of the

operation actually performed should be left to the jury to decide from the facts proved in the particular case.

"It was attempted to raise the question of consent in a case decided by the Appellate Division of the Supreme Court of New York, Second Department, in 1903, but the theory upon which the case was brought, namely, that the physicians were employed to cure the patient of certain pains and that they carelessly and negligently and unskillfully conducted themselves in the treatment of the case, was such as to preclude the plaintiff from properly urging the question of consent. In this case, the patient, a boy, eleven years of age, who was suffering with pains in his right arm, was sent by his mother in care of a woman of mature years to a hospital for treatment. After an examination of the boy, it was determined that he was suffering from blood-poisoning and that an immediate operation was necessary. Whereupon, he was placed under the influence of chloroform from the effects of which he died while the operation was being performed.

"The testimony of the mother was that she sent the boy to the hospital with the woman to see what was the matter with his arm, just to be examined. It did not appear, however, from the testimony of the woman that she made any statement to the physicians of any limitation upon the purpose of the visit, but she did testify that 'neither of these doctors said anything else to me; they did not tell me that they were going to perform an operation on the boy.'

"One of the physicians swore upon trial that he told the woman in charge of the boy the result of the examination and that an operation must be performed at once and that it would be necessary to administer an anesthetic. He says that the woman told him to go ahead and do what was best for the boy. In commenting upon the question of consent, Mr. Justice Woodward said:

" 'The employment of the defendants by Robert Wood (the boy) appears to have been with the knowledge and consent of the mother, the plaintiff in this action, and in the absence of some evidence that the defendants knew that they were not expected to act without further authorization, there was no question which might properly be submitted to the jury. Why should the defendants, employed by Robert Wood, with the consent of his mother, who had sent him there for the purpose, be expected to ask Agnes Evans for permission to perform an operation which to them appeared necessary, and which, under ordinary circumstances, would have been a very simple matter? When we call a physician or surgeon we submit our case to his care; we act upon the assumption that he knows more about the matter than we do, and consent is given by implication for him to do whatever appears to be necessary or proper for our relief, and in the absence of some evidence to show that the defendants had notice that their services were only to go to the extent of an examination, it cannot be said that the defendants were guilty of negligence

of any duty owed to the plaintiff or her son in not asking Agnes Evans for her consent to the operation. If the operation, considered in its surgical aspects, was one of great peril, it might be that the defendants would not be justified in proceeding without consultation with the mother or some person of suitable age authorized to act for her, but it appears from the evidence, without dispute, that the operation was of a very simple character, not likely to be attended with serious results, and that the cause of the patient's death was not the surgical operation, but the chloroform, which in the peculiar condition of the boy, resulted fatally. There was, as appears from the evidence, no reason which was apparent why the boy could not undergo the administration of chloroform and the operation without danger, and, as the plaintiff alleges the employment of these defendants to attend him and cure him of certain pains which he had in his right arm, it is hardly consistent in her to now claim that the employment was only for the purpose of an examination. The two positions cannot be supported at the same time, and if the allegations of the complaint are true, the defendants were not negligent in doing whatever in their best judgment was calculated to produce the result for which they were employed.'

"The Supreme Court of Maryland, in 1888, rendered a decision in the case of State, etc., vs. Housekeeper *et al.,* in which the words of the court were reassuring indeed. In this case the husband, who had brought suit, testified that the physicians had been employed to perform an operation upon his wife for the removal of what was supposed to be an innocent tumor from the right breast, but that the physicians operated for cancer, removing the entire breast. That he did not, and never would have consented to the operation which was actually performed. The evidence did not show whether the wife was informed of the character of the operation which the physicians proposed to perform. In passing upon this state of facts, the court said: 'The party who allows a surgical operation to be performed, is presumed to have employed the surgeon for that particular purpose.' Further, the court said: 'The consent of the wife, not that of the husband was necessary. The professional men whom she had called in and consulted were the proper persons to determine what ought to be done. They could not, of course, compel her to submit to an operation, but if she voluntarily submitted to its performance, her consent will be presumed unless she was a victim of a false and fraudulent representation which is a material fact to be established by proof.'

"The physician who reads the words of the court in this case, will undoubtedly be strongly impressed by the soundness as well as the justness of the position taken by the court. But he doubtless will be greatly perplexed when he attempts to harmonize the attitude of the court in this case with the attitude taken in the Minnesota case above referred to. In fact, it is impossible to harmonize the attitude of the courts in these two cases, except upon the theory that the evidence given in the one case, the character of the witnesses

who testified, their manner of testifying and the weight to which the court considered their testimony entitled, all differed so materially from that of the other case that the courts in the respective cases, directing the words used to the facts in the particular case, were justified in the different statements of law applicable thereto. *Accepting this theory, the physician is brought to the conclusion that he must in all cases either keep within the strict scope of the authority expressly given to him, or must surround himself by such safeguards that he can show to the court and jury, by the testimony of thoroughly credible witnesses, that he was employed to perform such operation as might be found necessary or desirable to be performed at the time of operating, and that the operation actually performed was so necessary or desirable to be performed at that time.*

The question from whom consent must be obtained, is one upon which there is some confusion, as indicated by the decisions of the courts. It is laid down as a general rule that the consent of the husband must be obtained before an operation is performed upon the wife. Such consent is, however, usually implied where the husband places the wife under the surgeon's care and especially where he understands the character of the intended operation.

"In fact in the case of State vs. Housekeeper, above referred to, the court took the position that consent of the wife was all that was necessary; that the positive prohibition of the husband would not legally hold the physician from operating, if the wife requested the operation to be performed. It would not be wise, however, for a surgeon to operate in the face of such prohibition, for by so doing he would surely invite litigation.

"In case operations are to be performed upon children or others incapable from mental weakness of understanding the import of the proposed operations, then consent should be obtained from the parents or other persons in *loco parentis,* or from the relations or those legally responsible for the care and protection of the person of the incompetent.

"Absence of consent may be made the gist of an action, not only in cases of operation, but wherever professional services are forced upon a protesting patient. A case in point, which is of considerable interest, arose in England some years ago. A woman, suspecting her housemaid of being in the family way sent for her physician and directed him to examine the maid. The girl objected to the examination but finally submitted, crying all the while. The physician found the woman's belief as to the maid's condition mistaken and so reported. The maid brought suit against the physician for assault, upon the theory that she submitted to the examination only through fear and duress. The verdict was for the physician. On appeal to the Manchester assizes, the two justices before whom the question of submission or consent was argued, disagreed, one being of the opinion that the submission of the girl under the circumstances did not represent her will and so could not be considered a consent; the other holding that she had consented to the examination. The court of appeals, upon further appeal, took the view that there

was consent; the judgment accordingly was permitted to stand in favor of the physician.

"Consent to perform a post-mortem must also be had except when performed in fulfillment of a requirement of law."

The further developments in the Minnesota case are given in the following quotation (Jour. Amer. Med. Assoc., April, 1906):

"A Minnesota physician some time ago found it necessary, in his judgment, to perform an operation somewhat different from that which had been first intended when the patient was put under anesthesia. As a result he was sued for damages, and the case has been before the courts now four times, the first trial resulting in a disagreement of the jury; the second, in a verdict of over $14,000 damages (set aside as excessive by the higher court), and the third trial, in a verdict of $3,500 damages. This verdict has now also been set aside. The judge says that had he known the evidence at the time of the third trial as he did afterward the result would have been different. The condition of the patient (with suppuration of the ear) demanded relief, because otherwise his life would have been left in jeopardy, and physicians called as witnesses testified that the procedure used was indicated. Therefore, decided the court, the surgeon would have been subject to criticism if he had not done what he did, and manifestly it is not right that he should be wrong both in doing and in not doing a certain thing. It appears from this that a surgeon who ventures to do what was not anticipated still undergoes a risk, yet in cases where his deviation was necessary or essentially life-saving and can be proved to be of that character, it is recognized that he ought not to be mulcted for damages."

The Supreme Court of Illinois, in a decision, discussed the points now under consideration. This instructive decision and comments thereon are presented in the following quotation from the Journal of the American Medical Association (1907, Vol. 48, p. 701):

"The decision of the Supreme Court in the case of Pratt vs. Davis emphasizes the necessity of surgeons having a clear understanding of their legal liabilities in undertaking important operations and the prudence of requiring explicit consent of the patient or his legal representative before beginning an operation. The decision covers three principal points of interest to surgeons: 1. What is sufficient consent to an operation? 2. How much is implied in consent once given? 3. What is the privilege and duty of the surgeon in emergencies arising in the course of an operation undertaken with previously obtained consent? When a patient is in full possession of his mental faculties his personal consent to a surgical operation on himself is a necessary prerequisite. It is obvious that this consent should be obtained after a clear presentation of the necessary facts in the case, and it would seem to be a judicious precaution to obtain such consent in writing. Unfortunately, the testimony in the case cited showed an attempt at deception that seems to

have been imprudent even if it might at the time have seemed justifiable. It would appear from the decision that whatever may be the implication involved in consent to one operation, it cannot be held to extend to a second operation, but explicit consent to this should be obtained. The decision on the third point is of great importance as it tends to put the duties of the surgeon in the course of an operation already undertaken in a clearer light. It is the duty and the legal right of the surgeon in the presence of unexpected conditions arising in the course of an operation to use his highest skill and judgment even if the consent of the patient or of his representative cannot be obtained. It is also right and the duty of the surgeon to act in accordance with the best teachings of surgery in emergencies in which consent cannot be obtained, even to the extent of performing operations.

"The Supreme Court of Illinois on the appeal of Pratt vs. Davis, an action by the latter, by next friend, for trespass to the person, has affirmed the judgment of the Appellate Court affirming a judgment in the plaintiff's favor for $3,000. The decision of the Appellate Court was reported at length in the Medico-legal Department of the Journal, March 11, 1905, page 822.

"In partial explanation of the case, the Supreme Court says that at the time of the wrong charged the defendant was engaged in conducting a sanitarium. The plaintiff, a married woman about forty years of age, came to the sanitarium for treatment for epilepsy, in May, 1896. She had been subject to epileptic seizures for a period of fifteen years, but up to this time she had been able to conduct her household duties and had borne four children, three since she first exhibited symptoms of epilepsy. The seizures had been gradually increasing in frequency. Following each of them she would be very weak in body and dazed and uncertain in mind for several hours. The evidence of those who knew her in her daily life was generally to the effect that her mind, except during the periods immediately following these attacks, was normal. The defendant made an examination of the pelvic organs, and found that the uterus was contracted and lacerated, and that the lower portion of the rectum was diseased. On May 13 he operated for these difficulties. Thereafter the plaintiff remained in the sanitarium without improvement for several weeks and then returned home. On July 29, her brother-in-law, at the request of her husband, took her again to the sanitarium, and on the next day the defendant performed a second surgical operation on her, removing her ovaries and uterus. She continued at the sanitarium until August 8, and then was removed to her home. Neither operation was successful so far as improving her health was concerned. She grew gradually worse mentally, and on August 25 was adjudged insane and sent to a State asylum. The cause of action was based on the removal of the uterus at the second operation. It was not claimed that the operation was unskillfully performed but that it was performed without the authority or consent of the plaintiff and constituted a trespass to her person.

"The declaration, so far as here material, averred that the plaintiff had placed herself under the care of the defendant and that he, without her consent or the consent of anyone authorized to act for her, anesthetized her and removed the uterus. There was no pretense that the plaintiff herself consented to the removal of the uterus. In fact the defendant testified that he told her just enough about her condition, and what he proposed to do, to get her consent to the first operation. Consent for further work was not obtained. Thereafter the defendant contended that the plaintiff was so mentally unsound as to be incapable of consenting or of giving intelligent consideration to her condition, and that her husband authorized the second operation. Whether the defendant was then mentally incapable of consenting was a question as to which the evidence was conflicting.

"Ordinarily, where the patient is in full possession of all his mental faculties and in such physical health as to be able to consult about his condition without the consultation being fraught with dangerous consequences to the patient's health, and when no emergency exists making it impractical to confer with him, it is manifest, the court goes on to say, that his consent should be a prerequisite to a surgical operation. Where the declaration shows the act to have been a trespass to the person, or avers it to have been without the consent of the patient, it would seem to be unnecessary to go further and negative the fact that some other person, lawfully authorized to act for the patient, consented. The question of the consent of such other person, if in the case, might well be left to be presented by a plea in bar.

"Furthermore, the Supreme Court is satisfied that the evidence as abstracted did not tend to show that the husband consented to the second operation. He testified that he did not, and that, when he first took his wife to the sanitarium, the defendant told him the operation would be a trifling one. The defendant said that, while he may have said this, 'Davis said he was willing that I should do anything I thought necessary, only he made the request that I do as little as possible,' and that he then told Davis, in substance, that two operations might be necessary. He also testified that while plaintiff was at home her husband 'told me she was no better. I told him to bring her back for the finishing work. I did not tell him what the finishing work would be. I had but one comprehensive talk with him. That was the time he was there with the plaintiff.' These two conversations were relied on by the defendant as authority given by the husband for the second operation. Without deciding what legal effect should be given to the husband's request or consent that a grave surgical operation be performed on his insane wife, the court thinks it manifest that the authority given by the husband in the conversation first quoted from was exhausted when the first operation was performed and the patient taken away. While it was true that the defendant said he told the husband in that conversation that he could not tell the extent of the surgery that would be necessary, and said that the

defendant gave him carte blanche to do whatever he saw fit, it was yet apparent that neither then contemplated that the wife would be taken home after the first operation and later brought a second time to the sanitarium for the purpose of undergoing a second operation, and the court thinks it equally apparent from the defendant's testimony that the husband did not, at the time he was directed to bring his wife again for treatment, understand that any such operation as the removal of the ovaries and the uterus was to be performed, and that the mere fact that he, after that conversation, had his brother take the plaintiff to the sanitarium, was not to be regarded as tending to show consent to surgery of that character.

"The defendant then contended that, in the absence of expressed authority to remove the uterus, the law would imply the necessary consent from the fact that consent was, as he said, obtained for the removal of the ovaries. But as there was no evidence which tended to show that any permission was obtained for the second operation, when the ovaries were in fact removed, the court holds that there was nothing to raise the implication in question.

"Again, it was urged that the evidence showed no actual damages, that the judgment must therefore be made up of nominal damages and exemplary damages, and that this was not a proper case for the infliction of a penalty, wherefore the judgment should be reversed. The claim that there was no proof of actual damages was based on this statement found in the defendant's argument: 'There is nowhere in the record a syllable showing any pain or suffering as a result of the removal of the uterus.' But the Supreme Court says that some facts require no direct proof. That pain and suffering following the removal of the uterus is one of such facts. The law infers pain and suffering from personal injury.

"Finally, the Supreme Court says that where the patient desires or consents that an operation be performed, and unexpected conditions develop or are discovered in the course of the operation, it is the duty of the surgeon, in dealing with these conditions, to act on his own discretion, making the highest use of his skill and ability to meet the exigencies which confront him, and in the nature of things he must frequently do this, without consultation or conference with anyone, except, perhaps, other members of his profession who are assisting him. Emergencies arise, and when a surgeon is called it is sometimes found that some action must be taken immediately for the preservation of the life or health of the patient, where it is impracticable to obtain the consent of the ailing or injured one or of anyone authorized to speak for him. In such event, the surgeon may lawfully, and it is his duty to perform such operation as good surgery demands, without such consent. The case before the court, however, does not fall within either of these two classes."

It would seem that consent to operation and to such details of operation as the surgeon may find best on examination or in the course of the operation, is implied when the patient accepts the surgeon's advice and goes through the prep-

aration for operation. The jury, however, does not always take that view of the matter. Consequently it is well to remove all chance of controversy on this point by having the patient sign a request for the operation and having the signature attested by a responsible witness, such as the nurse or an assistant physician or the family physician if he happens to be present. If convenient, it is well to have the husband also sign the request as indicated in the form below. The following, with place and date, is a satisfactory form:

> I herewith request the performance of the required operation and such additional work as may be found necessary or advisable at the time.
>
> Witness..... .....
> (Signature of Patient.)

When the assistant physician is leaving the operative orders, it is a simple matter for him to write out the above request as a regular note in the history, have the patient read it and sign it, and then sign himself as the witness. When the husband appears querulous as to what is to be done or not done, it is a good plan to have him sign the request below the wife's signature. If the patient is a girl under age, her signature should be accompanied by that of one of the parents.

This request puts the matter entirely in the hands of the surgeon so that he may use his judgment for the best interests of the patient. If the lesion should prove to be some unusual one, quite different from that supposed, it may still be removed, for such operation then becomes the "required" one. Any additional conditions found may be taken care of as seems best. The request is simple and reassuring in form and need cause the patient no additional anxiety, particularly if it be presented to her as simply part of the routine of preparation for operation.

If the patient wishes to make any exception to the latitude of action, such exception should be noted in the request. This enables the operator and patient to understand each other clearly. For example, in a recent case of the author's requiring hysterectomy, the patient decided after full consideration that she wished both ovaries preserved even though they should be found diseased. The decision seemed to be against the patient's best interests, still it was her right to insist on it if she desired to do so. The exception to the latitude of action was noted in the signed request, and at the operation both ovaries were preserved, though one was so much diseased that it is very likely to give subsequent trouble.

At first the author required a signed request for operation only in cases which seemed particularly liable to misunderstanding or subsequent controversy. He has concluded, however, that it is advisable to require the same in all cases of major operation.

A major operation is a serious matter, fraught with consequences which in

some cases may not be foreseen. The prevention of misunderstanding or imposition, as the case may be, fully warrants the slight formality of a signed request, unequivocally giving the surgeon the right to do for the patient what in his judgment seems best according to the findings in the case. Any specific exception the patient wishes to make may be duly noted in the request. From the standpoint of the patient the objection may be raised that such a signed request leaves too much to the judgment of the surgeon. This objection, however, is not justified. Such latitude of action is implied in every verbal assent to an abdominal operation, for it is well understood by the informed that unusual and unexpected conditions may be found in any case. The written request simply clarifies the matter. Again, whatever the conditions present, the surgeon is the one qualified to know what is best for the patient. If the patient so doubts the surgeon's judgment or conscientiousness that she feels he could not or would not do what is best for her, then she should seek another surgeon. From the surgeon's standpoint, he certainly would not wish to assume the responsibilities of operation for such a doubting patient.

FOREIGN BODIES LEFT IN ABDOMEN.

This is a subject the importance of which is frequently not appreciated by the physician until he is involved in a lawsuit concerning the same. Consequently in the following pages the author details some illustrative cases to call attention to the subject, that the danger may be recognized and avoided.

Lawsuit, Small Gauze Strip Extracted from Abdominal Sinus. In a case of retroflexion, Wiggin did a vaginal fixation and also removed the left ovary. Suppuration followed presumably from the stump. Later, laparotomy was performed for the removal of the ligatures. This was followed by an abscess in the abdominal wall and a persistent sinus. The patient then went to another institution, and later a small gauze strip was taken from the sinus. Suit was entered for $10,000.

Dr. Wiggin contended that the gauze was not the kind he used in sponging, and that the small strip had probably been left in the sinus while the patient was being dressed at the other institution. Verdict for the defendant.

Lawsuit, Small Gauze Sponge Removed by Secondary Operation. The patient was operated on for appendicitis by Gillette. After the abdomen was open it was found that the trouble was tubal pregnancy. The appendix excision was closed and a median incision made, and through that the operation was completed. About four days after the operation the appendix incision began to discharge pus. Gillette treated this sinus persistently under the impression that it was kept up by unabsorbed kangaroo tendon, which might at any time be wholly absorbed and thus permit healing. After twelve months of this treatment the patient went to another physician, who, eighteen months after the first operation, did a secondary operation and found a small gauze sponge, after which the patient recovered. Suit was entered for $5,000.

In the trial court the verdict was for the defendant on the ground that the cause of action, if any arose, was barred by the statute of limitation. The Circuit Court held that the trial court was in error and reversed the decision. The Supreme Court was divided equally on the subject, hence the decision of the Circuit Court was allowed to stand—verdict for the plaintiff.

Lawsuit, Sponge Left in Abdomen. Baldwin was made defendant in a suit, and a question that assumed much importance in the case was as to whether the responsibility for the count of the sponges lay with the surgeon or with the nurse. The suit against the surgeon was finally withdrawn, and legal action was begun against the hospital where the operation occurred.

Lawsuit, Sponge Removed at Secondary Operation. The patient was operated on for an abdominal tumor by Thorne. Several months later a secondary operation was performed by another surgeon and a sponge was found in the abdominal cavity. The patient recovered. Legal proceedings were begun against the first operator (Miss May Thorne) on the ground that she was guilty of negligence in not personally counting the sponges used in the course of the operation before the wound was closed.

The defendant denied negligence and held that the leaving of a sponge was an accident that could not always be avoided. She further said that, like a large number of other operating surgeons, she left the counting of the sponges to a responsible nurse—considering that it was the duty of the surgeon to keep his or her eyes continually upon the patient until the wound had been closed.

The judge, in summing up the case, said there was no doubt that the defendant was a skillful surgeon, but the question in this case was not as to her skill, but whether she had been guilty of want of reasonable care. The points for the jury were: (1) whether the defendant was guilty of want of reasonable care in counting or superintending the counting of the sponges; (2) whether the nurse was employed by the defendant and under her control during the operation; (3) whether the nurse was guilty of negligence in counting the sponges; and (4) whether the counting of the sponges was a vital part of the operation which the defendant undertook to see properly performed.

After a lengthy consideration the jury returned a verdict for the plaintiff.

Criminal Trial, Sponge Found at Autopsy. The patient was subject to exploratory laparotomy by d'Antona. A carcinoma of the liver was found, and an unfavorable prognosis given. The patient recovered from the immediate effects of the operation, but died after a month. At the autopsy a gauze pad, 70 by 40 cm., was found and also two liters of pus. The physicians who made the post-mortem examination gave out a statement to the effect that the death was due to the presence of the sponge and the peritonitis and secondary pleuritis resulting therefrom. The public prosecutor then had d'Antona indicted and placed on trial for criminal negligence.

The verdict was that the patient would have died from the other causes present. The prosecutor then claimed that the hospital records had been falsified, hence a new trial was granted. In the second trial ten experts were called and they all testified that there was sufficient cause for death outside of any influence which the sponge within the abdomen might have had. The trial was then discontinued because of the absence of prosecuting evidence.

This case was reported by Prof. Pio Foa, who stated that, if the autopsy had been conducted by competent pathologists, such an erroneous report would not have been made, and the unfortunate trials would not have occurred.

Lawsuit, Sponge Left in Abdomen. The patient was subjected to abdominal section by Schooler. Later developments indicated that a sponge, sixteen inches square, had been left in the abdomen. Suit was entered for $1,500. Verdict for the plaintiff.

Lawsuit, Sponge Left in Abdomen. The husband of the plaintiff was operated on for appendicitis by Hageboeck. It was charged that a surgeon's sponge had been left in the abdomen and that this caused an abscess which resulted in death. Suit was entered for $50,000.

In two trials the jury disagreed. It was reported that in each trial the jurors stood 11 to 1 in favor of the plaintiff. The case was to come up for a third trial the latter part of the year.

Criminal Trial, Forceps Found in Abdominal Cavity at Autopsy. A patient with a large fibroid was operated on by Lassallette. Death occurred a few hours after the operation. Autopsy disclosed a forceps in the peritoneal cavity.

At the trial the operator was condemned to two months in prison for homicide through negligence. The sentence was served.

After serving the sentence, Lassallette put in a plea that the patient's death had not been caused by the retention of the instrument, but by nux vomica. The death occurred too soon to have been due to the presence of the instrument. It was proved that a midwife of bad reputation had a bottle of nux vomica in her hand at the house on the day of the death. This was an entirely new phase. The body was exhumed. Lassallette was acquitted.

Criminal Trial, Two Artery Forceps Found in Abdomen at Secondary Operation. The patient was operated on for ovarian cyst, December 22, 1897, by Prof. Kosinski and Dr. Solman, in the latter's private hospital. After a few days there appeared fever and a mass, which continued. In the meantime two artery forceps had been missed, and it was thought they might be in the abdomen. The disturbance persisted, and six weeks after the operation the abdomen was reopened and the mass of exudate investigated, but neither forceps nor pus was found. The patient was better afterward and went home, but did not get well. Later a hard mass developed near the umbilicus. Kosinski still thought the forceps might be in the abdomen, and insisted on another operation and offered to perform it gratis. But the sons would not

hear to this, and the patient was taken to several other physicians, one after another, hoping to be cured without operation. Finally, six months after the primary operation, the symptoms became acute and threatening, and the physician who was called in insisted that the patient be taken to Kosinski at once, that he might perform the operation, which had then become imperative. This the family refused to do and called in another physician, who operated. On opening into the mass at the pelvic brim he found a cavity in which lay the two artery forceps. Both forceps had forced an entrance into the external iliac artery. The removal of the forceps was attended with a furious hemorrhage, from which the patient died on the table.

Legal action was entered against Kosinski and there was an extensive trial, with an imposing array of legal and medical talent. Six experts were appointed to testify in the case—Przewoski and Troichij to consider the pathologico-anatomical features, Krajewski to describe a modern laparotomy, Maksimow to criticize the operation as performed in this case, Pawlow to consider the various complications and mistakes that may occur in a laparotomy, and Neugebauer to supply the statistics which might be required in the trial. It was for use in this trial that Neugebauer complied the list of cases that he published the following year (1900), which publication has done so much to enlighten the profession on this subject.

The trial resulted in the acquittal of the accused as far as causing the death of the patient was concerned—it having been shown that he strongly insisted on a line of treatment which would probably have prevented the patient's death had the treatment not been peremptorily rejected by the family.

A curious clinical feature of this case was that, during the patient's illness, a number of radiographs of the suspicious area were made, but not one of them showed the forceps—the failure being due doubtless to defective technique.

Lawsuit, Artery Forceps Extracted From a Sinus. The patient was subjected to operation for a sarcomatous growth in the abdominal wall by Dollinger. The patient was three months pregnant at the time of the operation. She recovered from the operation and was delivered at term without any special disturbance. She became pregnant again. Her health was excellent and she was able to do all her housework. In the latter part of the pregnancy there appeared in the operative scar a swelling, which opened and discharged much offensive pus. The abscess was still further opened by the family physician. Within a few days she was delivered. A few days after the delivery an artery forceps was discovered in the abscess wall. The patient was sent to the hospital and the forceps removed by operation. The patient died two days later.

The husband of the patient demanded money of Dollinger, which demand was refused. He then went to the public prosecutor and endeavored to have a criminal prosecution brought against the surgeon. The prosecutor asked

Dollinger for a written statement of the case, which was given. The prosecutor saw no evidence to warrant criminal proceedings, and dropped the matter.

The husband then brought civil suit, and for thirteen months Dollinger spent all his time defending himself. Sensational reports appeared in the public press, and it is said that the comic papers made capital of it and pamphlets on the subject were sold at the cigar stands. Though acquitted, Dollinger suffered irreparable damage from the sensational newspaper reports and the consequent notoriety. He urges strongly that some means should be provided by which reputable physicians may protect themselves from this species of blackmail and newspaper persecution, which necessarily results in serious loss.

Criminal Trial, Piece of an Instrument Left in Abdomen. A Paris surgeon lost part of a broken instrument in the abdominal cavity. The patient died. The surgeon was put on trial for manslaughter due to negligence. Result of trial not stated.

Lawsuit, Pair of Spectacles Found in Abdominal Cavity. The patient had three operations—the first in America, the second in Germany and the third in France. The French surgeon found a pair of spectacles in the abdomen. The patient sought redress in the courts.

The outcome of the trial is not given, neither is it stated definitely who was sued. Neugebauer, who cites the case, blames the German surgeon—noting that he either left the spectacles himself or missed finding them if left by the previous operator.

Lawsuit Threatened, Gauze Compress Discharged Per Rectum. The patient had been subjected to vaginal section, for pelvic suppuration, by MacLaren. It was a very severe case. There was persistent bleeding requiring packing, and there were two secondary hemorrhages requiring repeated packing. The patient recovered. Two months afterward a very offensive discharge appeared and the patient extracted a twelve-inch strip of iodoform gauze from the vagina.

Suit was threatened, and, on the advice of his attorney, MacLaren paid the patient a considerable sum to avoid further proceedings.

Lawsuit Threatened, Cotton Compress Discharged Per Rectum. The patient had uterine fibroids, which Borysowicz removed by abdominal operation. Three weeks later a gauze compress was passed per rectum. Evidently the compress had been left in the peritoneal cavity at the time of the operation. The patient recovered and thanked the operator most gratefully for his services and left him her photograph. Six years later he received a number of letters from the patient's husband, threatening prosecution for malpractice if he did not at once pay a certain sum. The husband had no doubt heard of a lawsuit (Kosinski's?) then on at Warsaw, and thought it an easy way to obtain some money from Borysowicz, Apparently nothing came of the effort.

Lawsuit Threatened, Forceps Alleged to Have Been Passed Per Rectum. The patient was operated on for a suppurating ovarian cyst by Tuholske. It was an

extremely severe case, but the patient recovered and regained her health rapidly. Twenty months later she wrote that she had given birth to a fine baby and felt well. Labor had been uncomplicated. The account continues: "Some five or six months after that (more than two years after the operation) the husband called on me and stated that for two or three months his wife had had some rectal trouble, supposed to be piles, and that a week ago, under considerable suffering, she had passed a forceps at stool. He brought it to me; it was a forceps such as is usually carried as dressing forceps in a pocket case—not a hemostat. I did not claim ownership. At any rate, if that forceps had been in the pelvis for two and a half years, during pregnancy and labor, without giving rise to a symptom or modifying labor, it was a remarkable occurrence. Three months after this episode the patient was reported well." In a later reference to the case, Tuholske stated that several demands were made for money, accompanied by threats of a suit. No attention was paid to the demands and finally they ceased. He expressed the opinion that it was an attempt to obtain money by blackmail.

The Question of Deception, Intentional or Otherwise. The repeated occurrence of this accident in the past and the possibility of its occurrence at any time gives an opportunity for designing persons to obtain money under false pretenses. Neugebauer calls attention to this fact, and remarks that, following the newspaper publicity given the Kosinski trial, a number of damage suits, alleging the accident, were filed, and that in most instances they were cases of blackmail of extortion.

A case has been reported of a patient who, following convalescence from an abdominal operation, expelled pieces of gauze or thin cloth from the mouth. The patient claimed that the expelled pieces were vomited sponges, which had worked their way into the stomach from the peritoneal cavity. Suit was threatened. The matter was dropped, however, when the practical impossibility of the occurrence, as detailed, was explained to the patient.

When discussing the subject of foreign bodies left in the abdominal cavity, a physician related to the author some of the details of a case in which he had been involved. He performed an abdominal operation, and, some time following the convalescence, the patient came to him and exhibited a surgical needle and stated that the needle had been passed per rectum. The patient's statement was confirmed by a physician who claimed to have treated him at the time the needle was passed. Suit was threatened. On examination of the needle the operator found it was not the kind he used at the operation, and he became convinced that the alleged occurrence was an attempt at blackmail.

The matter dragged along for some time. The operator accumulated all the information he could concerning the subject and concerning the parties involved, and finally confronted them in such a way that they were forced to make a written statement, acknowledging that the needle had not been passed per rectum, as alleged. The needle exhibited had been obtained elsewhere for the purpose of threatening suit and extorting money.

Porter gives an account of a peculiar case bearing on this subject. The operation was for a parovarian cyst and hydrosalpinx and chronic appendicitis. The convalescence was normal and the patient left the hospital twenty-two days after the operation, feeling well. Eight days later, Porter received a telephone message from the patient's family physician, stating that he had removed several pieces of gauze from her vagina.

Quoting from the report, "On inquiry from him I learned that the pieces did not tear off, but came away, or rather were removed with forceps, in the shape of rolls about the length and size of a lead pencil, and after all presenting were removed others would present in a few hours, requiring that he visit her two or three times a day to take them away. The doctor thought that the pieces came from the pelvic cavity through an opening in the right side of the vagina about the size of a lead pencil.

"On the next day after learning of the matter, I visited the patient at her home with her doctor, and found the patient on a cot apparently suffering some pain, which she said was due to more pieces 'coming down.' She did not look sick. In reply to my question she said she felt well until she got a jolt on the car on her way home and that since then she had been having pain, which was worse at times, and had not been so severe since the pieces began to come away. The first knowledge the doctor had of the nature of the trouble came through the patient's husband, who told him that there was a piece of gauze protruding from the vagina. I asked to see what had been removed and was shown a large number of pieces of different texture, whereupon I remarked that the goods were not such as I had used as sponges, that there were more pieces than had been used all told in the operation, and that consequently they had not been left in the woman's belly by me. It was averred that they could get into her belly only through the wound made by me and at the time it was made, because it had been closed, healed by first intention, and was still closed. The patient facetiously remarked that she 'supposed she swallowed 'em.' 'No,' I replied, 'had you swallowed them they would not come out through the vagina.'

"Dr. F. now asked the patient if she thought more 'pieces were down.' Being answered in the affirmative, he introduced a speculum and found that she was right. I removed the speculum, and, introducing my finger, came upon a small wad of something which, upon removal, proved to be a piece of ordinary white muslin about three inches wide by seven inches long, twisted into a rope and doubled upon itself so as to make a small ball or wad. It was perfectly clean, and was so saturated with what looked and smelled like urine that on squeezing between the fingers several drops were squeezed out. I examined the vagina with my finger, assuring myself that there were no more 'pieces' there, that there was no hole leading into the pelvic cavity and that, in fact, it was a perfectly healthy vagina and in nowise unusual except its cleanliness, for which, of course, the frequent wipings it received were accountable.

"In the presence of the patient, her mother-in-law and the doctor I said, pointing my finger at the patient, 'Doctor, I don't know where those rags came from,

but that woman knows very well, and could tell if she would.' The mother-in-law objected to my statement rather forcibly, but the patient said nothing. I then took the doctor outside, told him that the woman was a malingerer and that we would give her a chance to put some more rags in for removal. We received one more piece before we left. Before leaving I insisted upon both the doctor and myself making a thorough inspection of the vagina with the eye and the finger as well. This was done, but no abnormality was found. It should be stated that some of the 'pieces' were tinged with blood, but not any of those removed at my visit."

Dr. Porter exhibited ten pieces of different size, shape and texture, and continued: "Eight days after my visit, Dr. Fisher reported 'no more exhibits.' So far as I know, no threat was made of a suit for damages, nor did the patient or her mother seem out of humor with me. The husband was at work and not present during my visit, although he presumably knew the day before that I was to be there, as I had sent word that I was coming."

In regard to the possible cause for the deception, Dr. Porter mentioned: 1 desire for money; 2, desire for sympathy; 3, desire to avoid work; 4, sexual perversity. He stated that during the patient's stay in the hospital nothing pointing to a neurotic condition was noted.

Schaefer gives the details of a case which emphasizes the fact that when a piece of gauze is found in the abdominal cavity it does not necessarily follow that it was left there in a previous operation. The case occurred in the practice of Pryce Jones. Jones was called to see a woman with an abdominal swelling. This proved to be an abscess, which was opened and discharged a piece of cloth.

There had been no previous operation. The woman was insane, and had been in the habit of tearing up pieces of cloth and swallowing them. The swallowed cloth had evidently caused ulceration of the stomach wall, with subsequent perforation into the peritoneal cavity.

The noted intestinal "hair-balls," requiring operation, constitute another class of foreign bodies in the abdomen which were not left there by the surgeon.

Again, the professional "knife swallowers" and "glass eaters" and their amateur imitators must be kept in mind. Fortunately the menu of these persons is limited, as a rule, to household articles. However, some such "actor," who has been relieved of his accumulated load by surgical art, might, from the intimate acquaintance, acquire a taste for surgical forceps instead of the usual nails and pocket knives. In that case a condition might easily develop that would make it very uncomfortable for the previous operator, though wholly without fault on his part.

The Remedy.

To make absolutely certain that no sponge or other foreign body is left in the peritoneal cavity at operation is a hard problem. The solution of this problem. is considered in Chapter XV (see continuous sponges and long instruments).

PERSISTENCE OF SYMPTOMS AFTER OPERATION.

The persistence of troublesome symptoms after an operation which was expected to give relief, is a source of disappointment to the surgeon and the patient, and the latter sometimes seeks solace in legal action. The action is usually based on all allegation of (a) want of care and skill or (b) nonfulfillment of promise. This brings up two questions, as follows: 1. What constitutes proper care and skill within the meaning of the law? 2. How much should we promise our patients?

What Constitutes Proper Care and Skill?

This question is discussed instructively in the following quotation from an article by Haberman (St. Louis Medical Review, 1909):

"The question of the degree of care and skill which a physician or surgeon must exercise arises in every action for damages on account of alleged malpractice. There are certain standards to which a practitioner must conform. If he does so, of course, there is no element of liability even though the result be unsatisfactory on the part of the patient. If, on the other hand, a practitioner has fallen short of the measure of care and skill which the law requires of him he may be liable in damages. The question of what degree of skill and care should be accepted as the standard in a given case depends always upon the facts and circumstances of the case, and is, like any other question of fact, to be determined by the jury under appropriate instructions of law to be given by the court. The court will apply the appropriate principles to the facts in hand and instruct the jury accordingly. It then remains for the jury to determine whether the practitioner has been remiss or not.

"In view of the fact that many practitioners specialize along certain lines and others undertake to fill the more ancient calling of a general practice, the legal principles applicable to a case of malpractice arising under the one or the other are different.

"A physician is said to impliedly hold out as a representation to a patient that he possesses that degree of skill and will exercise that degree of care which is ordinarily possessed and observed by others in like callings and in similar localities. The question of locality necessarily plays an important part, as a physician practicing in a settled community, having readily accessible instrumentalities which would not be available to a practitioner in a rural and sparsely settled community, would be held to a degree of care much higher than the latter.

"The rule is strict against the trying of experiments without the knowledge and consent of the patient. It is necessary that established and accepted forms of treatment be followed and if a physician, whether he be a general practioner or specialist, undertake an experiment, the same is undertaken by him at his own peril. If the ordinarily and generally accepted practice is that a given ailment

be treated in a certain manner and some other method is adopted which results in injury to the patient, it is not a matter of any consequence how much skill was possessed by the physician, and his failure to follow the accepted form of treatment would be held to constitute negligence."

There is a point here which the quotation does not touch upon, viz., the improvements constantly being made in the "established forms of treatment." These improvements are possible only through pioneer or experimental work, using the term experimental in its largest sense. Without such work all progress would stop—and surely such a state of affairs is not contemplated by the law and should not be encouraged by any interpretation of the same. The "experiments" referred to in the above quotation are evidently innovations for which there is no justification in the nature of the case considered in conjunction with contemporaneous practice. Where "improvement" ceases and "experiment" begins, is a point which might be difficult to decide in a disputed case. The danger of subsequent trouble from designing persons, as well as care for the best interests of the patient, should make the surgeon very careful in the adoption of new methods. Such methods should not be taken up for general use until they have been tried out in a reliable way by competent authority.

Continuing the quotation:

"The fact that the service is gratuitously rendered does not change the principles applicable for the purpose of determining whether the physician or surgeon is chargeable with malpractice. The same degree of care and skill is exacted of a physician or surgeon in the performance of gratuitous services as one who expects to receive compensation therefor.

"It is elementary to say that a physician does not warrant a cure, and if the practitioner has exercised the degree of skill and care with which he is chargeable under the law, he is under no liability to the patient, even though an unsatisfactory and unfortunate result be attained.

"Quite apart from the question of the degree of technical skill required of a physician or surgeon, as the case may be, is the question of lack of care involved in non-attendance to a patient. If a physician answers a call there is an implied contract that he will give the patient that attention which is necessary until such time as the same be no longer necessary or the physician be discharged from attendance. One who leaves a patient at a critical stage of a disease without reason or sufficient notice to enable him to procure another medical attendant, to the patient's damage, is guilty of an actionable wrong. The physician is bound to use not only the ordinary care and skill exacted of men in his class, but is bound to exercise a discriminating judgment as to when his visits may be safely discontinued.

"The foregoing comments apply to practitioners generally without undertaking to differentiate between general practitioners and specialists. The degree of care and skill with which a general practitioner is chargeable is, however, different from that standard to which the law holds a specialist.

"A general practitioner is said to be 'bound to bestow such reasonable ordinary care, skill and diligence as physicians in the same neighborhood in the same general line of practice ordinarily have and exercise in like cases.' He must keep himself informed of the general advancement in matters pertaining to his profession and is chargeable with negligence if he fails to conform to the requirements of advances in science which are generally understood and followed. He is chargeable with a reasonable degree of skill as distinct from the very highest degree of skill and with ordinary care as distinct from a very high degree of care, but for the absence of such ordinary skill or the failure to exercise such ordinary care, resulting in damage, the physician is liable at law.

"The standard of skill and the degree of care to which a specialist is required to conform is much higher than that required of a general practitioner. One who holds himself out as a specialist impliedly warrants that he possesses a degree of skill and knowledge higher than that possessed by a general practitioner and furthermore that he is the possessor of that degree of skill and knowledge which specialists in his particular department who keep pace with the advancement in such specialty, possess. It has been held in Missouri in an adjudicated case that a specialist will be held to that degree of skill which he holds himself out to possess and that by professing to be a specialist he holds himself out to possess 'a degree of skill and diligence * * * as high as that possessed by other good surgeons of the specialty to which defendant belonged.' (McMurdock vs. Kimberlin, 23 Missouri Appeals 1, c. 531.)

"It will thus be seen that the specialist is chargeable with bringing to the aid of his patient a degree of skill and knowledge such as is possessed by physicians who give special study to the specialty, having regard to the state of scientific knowledge at the time of the treatment.

" 'The physician is not to be judged by the mere result obtained or for mere errors of judgment. His negligence is to be determined by recourse to the pertinent facts existing at the time of his examination and treatment, of which he knew, or, in the exercise of due care, should have known. It may consist of a failure to apply appropriate remedy upon a correct determination of existing physicial conditions, or it may precede that and result from a failure properly to inform himself of these conditions.' (Rand vs. Twitchell, 71 Atlantic, 1045, Vt.)

"The general practitioner in many instances, confessing that he has reached the end of his resources, refers the patient to a specialist. This well illustrates the difference in the degree of skill which may properly be exacted of the one and of the other. The general practitioner adopts the remedies and treatment most appropriate under the circumstances in the light of his general practice, but is not liable for negligence in failing to obtain desired results and upon realizing this situation refers the patient to a specialist who is properly expected

to possess a higher degree of skill and care and, by the fact of holding himself out as a specialist, to warrant that he possesses the same.''

How Much Should We Promise Our Patients?

What will be the immediate result of the operation—will the patient pass safely through it? What will be the remote results of the operation—will the disability and the troublesome symptoms be relieved?

These are questions of vital importance to the patient. She asks, and she has a right to ask, for specific information on these points, and the surgeon is in duty bound to answer the questions intelligently and conscientiously. It is not an easy task. There is considerable uncertainty in any case and the probabilities of complete relief are surrounded by possibilities of quite a different character. There are two ways of dealing with this phase of operative work, one way being better for some patients and the other way better for others.

1. The most common method, and the preferable one in the majority of cases, is to avoid the prognosis almost entirely. The results hoped for, and which usually follow the operation in question, are pointed out, but the patient understands that owing to the uncertainties always present the results cannot be definitely promised in any case. The operator is to do the work in a careful and thorough manner, and if no unusual condition develops the intended results may be expected. With most patients this general understanding without specific discussion is satisfactory. In many cases detailed discussion of the pros and cons of the various untoward results that might come, would increase the patient's worry and distress without any corresponding benefit.

2. In certain exceptional cases specific discussion of the probabilities in regard to immediate and remote results is called for. This may be (a) because the patient evinces misunderstanding in regard to the matter or (b) because the patient is undecided as to whether the probability of benefit is sufficient to justify the trouble and expense of operation, and wishes to carefully weigh all features of the subject. In such a case the facts available should be placed before the patient as extensively as she desires. The responsibility of decision rests with her and she depends on the surgeon to put before her the facts on each side of the question.

An important point is to avoid persuading the patient toward operation. After the information and advice are given, the patient should be left undisturbed to deliberate on the subject and to make her choice freely. The author is careful to avoid operating for a patient who is undecided as to whether or not she really wishes the operation. When a patient comes for operation in that state of mind she is advised to wait. The matter should be settled definitely in her own mind, either by personal consideration of the various facts or by deciding to be guided by the surgeon's advice. The responsibilities which the surgeon must assume are numerous enough without adding any unnecessary ones.

The subject of promises to patients is very well summed up in the following remarks by Howard A. Kelly in a discussion before the American Gynecological Society (Transactions, 1896):

"I think to protect ourselves as specialists certain rules ought to be adopted which I follow in my own case. We ought to keep a written record of the history of cases and of the subsequent visits made. We ought to note carefully the examination, and under the head of examination I think it is always important to put down what the patient says, in her own language, of her present condition. There is often a wide discrepancy, when she comes back and says she is not improved by the operation, between her statements at the first visit and afterward. You can call her attention to the fact that certain things have disappeared, and she is often ready to acknowledge it when she recollects them. I think it is important to note, the first time you get a clear idea of the case, what line of treatment it is proposed to follow and what is promised as a result of that treatment. I am also very careful never to promise absolutely to effect more than a mechanical result in a surgical operation. The patient comes to us, as a rule, for pain, and we look to another thing—the mechanical result which the surgical operation is going to effect—and we are sometimes working at cross-purposes. We get the mechanical result, but the patient may keep the pain and be dissatisfied for that reason. So I promise the patient to remove the disease or correct the deformity but I promise nothing more, absolutely. I always state to the patient that while the chances are in favor of recovery and relief, the relief is not promised as absolutely certain."

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